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A HAND-BOOK
OF
GENERAL AND OPERATIVE GYNECOLOGY

BY DR. A. HEGAR AND DR. R. KALTENBACH

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In Two Volumes.

VOLUME II.—OPERATIONS ON THE TUBES, UTERUS, BROAD LIGAMENTS, ROUND LIGAMENTS AND VAGINA. OPERATIONS IN URINARY FISTULÆ. PROLAPSE OPERATIONS. OPERATIONS ON THE VULVA AND PERINEUM.

WITH TWO HUNDRED AND FORTY-EIGHT WOOD ENGRAVINGS

EDITED BY

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A HANDBOOK OF

General and Operative Gynecology.

CHAPTER I.

OPERATIONS ON THE TUBES.

DEFINITION OF THE SUBJECT.—HISTORY.

IN castration, ovariotomy and supra-vaginal amputation of the uterus, the tubes are often extirpated for purely technical reasons,—because they form a part of the pedicle, are closely applied to a tumor, or because, as happens frequently in castration, the ovaries cannot be removed entirely without coincident salpingotomy. In such cases salpingotomy is merely an accident. In certain castrations, however, it may possess greater significance, inasmuch as it not alone renders the operation possible, but also aids *per se* in securing the subsequent curative effects of the surgical operation. In pelvic peritonitis, and in the so frequently associated occlusion of the abdominal end of the tube with secondary dilatation, stasis of secretion, *i.e.*, small hydrosalpinx and small tubo-ovarian cysts, we may often remain in doubt whether the extirpation of a healthy ovary with the subsequent menopause, or that of a small cyst, cirrhotic ovary, or the removal of the diseased tube, has had the greater share in the curative effects. In the majority of cases the removal of the ovaries is probably most important, and we have therefore classed such operations under the head of castration.

Hæmatosalpinx occurs mainly in atresiæ of the genital canal, and will be discussed in detail under that heading. Apart from tubal pregnancy, the collection of blood is also observed in hydrops tubæ, especially in old people. The surgical treatment is similar to that of hydrosalpinx.

This section will treat of the operative procedures in hydrosalpinx, in so far as it has not been discussed under the head of castration, in pyosalpinx, and, finally of an entirely new acquisition, *viz.*, the operations in genital tuberculosis.

The history of tubal operations is comparatively new.

Large tubal sacs, filled with watery fluid, were removed long since on account of diagnostic errors, inasmuch as they had been regarded as ovarian cysts. Simpson was the first who adopted surgical measures intentionally in cases of tubal sacs which could be felt through the vagina. He claims to have cured eight cases by vaginal puncture. Frankenhauser recently adopted this plan, but was compelled to perform puncture repeatedly and to introduce a catheter, through which disinfectant injections were made. Nevertheless the sac refilled a number of times, and later it ruptured spontaneously, so that seven months elapsed before recovery occurred.

Frankenhauser and Bandel have also recommended and practised manual compression of the sac towards the uterine cavity. On account of the possibility of rupture into the abdominal cavity this method merits very little recommendation, inasmuch as we are rarely able to foretell with absolute certainty that the contents are not purulent and injurious.

Catheterization of the tube and restoration of permeability in this way have also been recommended. Tyler Smith attempted to cure sterility by catheterization of the tubes. Finally, Frorieps and Kocks endeavored to produce sterility by artificial occlusion of the tube by means of catheterization with nitrate of silver or a galvano-caustic sound, in cases of narrow pelvis, certain cardiac affections, pulmonary and renal diseases, psychoses.

It is only in recent times that operations on the tubes have been performed extensively, after a proper diagnosis and with the full consciousness of the significance of the operation. In November, 1876, Hegar successfully removed a tubal tumor which had been mistaken for an ovarian cyst, and in October, 1877, he removed a bilateral pyosalpinx. In November, 1877, he extirpated a bilateral hydrosalpinx, whose diagnosis had been based on the peculiar furrows and sausage shape of the tumors.

In his first writings on castration Hegar had employed the term salpingotomy, and had discussed its relations to castration, its independent position, special indication and certain peculiarities in the technique.

Tait's first extirpation of the tubes dates back to May 23rd, 1879.

He had previously performed drainage of an hæmatosalpinx (the condition is not quite clear), upon which he had stumbled in consequence of a mistake in diagnosis (Brit. Med. Journ. May 11, 1878).

Martin's first operations also occurred subsequently to those of Hegar.

Schwarz, Baumgaertner and Kaltenbach are also among the first operators. The latter met, during an ovariotomy, with a peculiar condition of the tube which formed an indication for its removal. On the side opposite to that of the tumor, the tube had entered the sac of an inguinal hernia, and thus formed between it and the floor of the pelvis a window-like opening, through which the intestine could have readily passed.

As a general thing, large ovarian tumors are rarely associated with serous or purulent accumulations in the dilated tubes which require extirpation.

The first intentional extirpations of the tubes on account of tuberculosis were performed by Mandach and Hegar.

GENESIS, ANATOMY AND DIAGNOSIS.

Tubal dropsy is the result of an inflammatory process in the pelvis which gives rise to the occlusion of the funnel of the tube, with or without adhesion to other organs or to the pelvic walls. The process may be started by disease of the mucous membrane of the tube or by a primary affection of the ovary, uterus, peritoneum or cellular tissue. A pyosalpinx of one side occasionally gives rise to an adhesive inflammation and hydrosalpinx of the other side. A tubo-ovarian cyst is nothing more than an hydrosalpinx, in which the septum between the dilated tube and a follicular cyst (more rarely a cystoma cyst) of the adherent ovary is perforated.

Tubal dropsy is rarely larger than a child's head, but it has sometimes been found entirely filling the pelvis like an ovarian tumor. Such cases usually refer to tubo-ovarian cysts.

The shape may be oblong, like a sausage or club, rarely round. There are often sharply cut grooves, which produce several (4 to 5) subdivisions, increasing in size towards the funnel. The uterine portion of the tube (about a third) is usually not affected or very slightly. The long tumor is generally curved, and even coiled somewhat on itself. If masses of exudation are situated between the subdivisions, or surround the entire structure, there results an irregular, more rarely a roundish tumor, whose consistence in various places is soft and fluctuating or firm.

The tumors are often situated in Douglas's sac, occasionally pushing down the posterior vaginal wall, or they occupy the posterior lateral portions of the pelvis. They are found more rarely in both iliac regions.

We usually find adhesions to the anterior, more commonly to the posterior, layer of the broad ligament, Douglas's sac, some part of the pelvic walls, the mesentery of the sigmoid flexure, the sigmoid flexure itself, bladder, rectum, or uterus. Adhesions to the anterior abdominal wall, omentum, loops of small intestine mesentery, are rarer. If the adhesions to the broad ligament are very firm, we are apt to assume an inter-ligamentary development, and this may really occur. In exceptional cases hydrosalpinx is perfectly free.

The wall of the dilated tube is usually atrophic and destitute of muscular fibres. The mucous membrane has no folds, has lost its epithelium, or at least its ciliated epithelium.[1] The wall is more rarely thickened, rigid and callous, and the canal then is usually not very much dilated. The canal may even be stenosed, so that the finest sound is barely able to pass. We may also find dilated parts, filled with fluid, alongside of stenosed portions. The latter then occupy chiefly the uterine portion. Uniform thickening of the entire wall is sometimes noticed over a considerable area, and occasionally there are veritable nodules, as in fibroma. We may also find small nodules in the uterine portion of the tube, with or without other fibromata in this organ.

Tubal dropsy contains a serous transudation which may assume a yellow pus-like appearance from the presence of desquamated, fatty cylindrical epithelium. But such admixtures gradually disappear.

The changes in the other pelvic contents are very numerous. The ovaries are usually in a condition of follicular cystic degeneration, more rarely there is complete cirrhosis of the organ. Large ovarian tumors have also been observed. The uterus presents changes of shape and position, hypertrophic conditions, endometritis, fibroma. Most important are the extremely manifold inflammatory changes in the pelvic peritoneum and cellular tissue, especially adhesions and retractions.

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[1] On account of these very changes, refinements, such as the formation of an ostium abdominale (resection of the adherent funnel and stitching of the cut surface), appear to be improper in tubal dropsy. But the genesis of this affection from a wide-spread inflammatory process in the pelvis, with all its numerous other changes, and the probability of a fresh, though insignificant adhesive process which would again occlude the new formed funnel, also testify to the uselessness of such an operation. In addition, it is not devoid of danger. Entirely apart from the greater duration of the operation, pregnancy, if it occurred at all, would be much more apt to be extra-uterine than intra-uterine.

Tubal dropsy *per se* only gives rise to symptoms when its size and position produce compression, or perhaps when contractions of the tube are induced by the irritation of its contents. The numerous symptoms found in hydrosalpinx are the result of other changes in the sexual organs, especially of the inflammatory conditions which have given rise to the hydrosalpinx.

Pyosalpinx has an entirely different significance. It arises from the conveyance of gonorrhœal secretion during coitus, from infection during labor (especially premature delivery), and perhaps not infrequently (at least in former times) by sounds or syringes.

It generally forms small tumors, and they very rarely exceed the size of a fist or child's head. The shape and position are similar to those of tubal dropsy. The adhesions are usually firmer and more extensive, and include those extremely firm adhesions which sometimes can be separated by the knife alone. The adhesions to the broad ligament may be so intimate that we are led to assume an intra-ligamentary development. It is a remarkable fact that perfectly free pyosalpinx has also been observed. Encapsulated serous transudations or even purulent foci are found not very rarely in the vicinity of a pyosalpinx. The poisonous contents of the tube acts through the wall, as an inflammation-producer, upon surrounding parts. The inflammations are more rarely the result of perforation.

This gives rise to the severe symptoms characteristic of pyosalpinx as compared with tubal dropsy. No other affection produces such frequent, constantly recurring inflammations of the pelvis. In addition menorrhagias and even metrorrhagias are very common. The symptoms accompanying hydrosalpinx, which are produced by compression or contractions, are also observed. Finally, the nervous system soon suffers, as a general thing, and we then notice the most manifold nervous symptoms in adjacent and remote nerve tracts.

Tuberculosis of the tubes forms tumors similar to those of pyosalpinx, but there are certain differences. The uterine third is not infrequently attacked, and we find round or irregular, angular, hard nodules, as large as a pea or hazel nut; the first one is often immediately adjacent to the uterus. The nodules consist of cheesy masses, which are rarely situated in the lumen of the tube alone, but usually in the tissues also.[1]

The constrictions are often very marked in tuberculosis, the intervening swellings are usually not very large and of firm consistence. In addition to the divisions containing solid tubercular masses we also find some with fluid contents. The uterine portion of the tube is filled occasionally with firm, even hard cheese, while the abdominal portion forms a large, fluctuating, club-shaped tumor. The adhesions are usually very firm and extensive; there may be very intimate connection with the broad ligament, or the latter itself may be rigid and thickened. The wall of the tube is usually thick, callous and more or less deeply infiltrated with yellow nodules. The tubercle not infrequently makes its way into the adhesions.

Tuberculosis of the tubes is often associated with a similar condition of the lungs, intestines, peritoneum and uterus. A more or less considerable sero-bloody transudation is not infrequently found free or encapsulated in the abdomen. Isolated tuberculosis of the tubes has also been observed. The ovary does not take part in the tubercular process, or not until a later period; it is usually in a condition of follicular cystic, or cirrhotic degeneration.

Tuberculosis of the tubes appears to be quite frequent; it has generally been mistaken for gonorrhœal pyosalpinx.

The diagnosis of tubal tumor is not particularly difficult. The characteristic shape of the usually bilateral, occasionally perfectly symmetrical tumors, their connection with the uterus and the peculiar consistence, are very significant. As a rule, the differentiation of the three kinds of tumors is also possible.

In pyosalpinx the infection may be demonstrated not infrequently. The inflammatory, febrile conditions are more intense, and recur frequently. The pains, the effect on the general condition, and the consensual symptoms are more pronounced.

The firmer consistence of all or certain parts of the tumor, the affection of the uterine portion of the tube, the peritoneal transudation, and the coincident affection of other organs, are peculiar to tuberculosis. But the fibrous, nodular thickenings of the tube may give rise to mistakes. The coexistence of uterine fibro-myomata will direct our attention to the error.

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[1] The thickened, cheese-like, or even calcified contents of an ordinary pyosalpinx should not be mistaken for tuberculosis. The distinction may generally be made with the naked eye, from the fact that tubercles are situated in the tissue itself. It is no longer believed, with Schroeder, that thickening of the pus in the lumen of the tube may give rise to tuberculosis of the tube or other organs.

INDICATIONS.

The symptoms observed in small tumors resulting from hydrosalpinx are owing almost entirely to the complicating morbid conditions which are the cause of the tubal dropsy. Disagreeable symptoms are particularly produced by pelvic peritonitis with its numerous sequelæ, pathological processes in the ovary and uterus. The indications for operation are therefore based chiefly on the other morbid processes, and the small hydrosalpinx is merely removed as an incident to castration.

Larger tumors, on the other hand, may produce symptoms by their size and position which in themselves justify surgical interference. This is still more true if steady growth is noticed.

In pyosalpinx the operation always appears to be indicated as soon as the diagnosis is assured. The symptoms are almost always so violent, and the steady aggravation and entire uselessness of all remedies are so constant, that the choice can not be doubtful. The exceptional cases, in which symptoms are very slight or absent, are so rare that they need not be taken into consideration. A vital indication may also arise, if rupture of the pyosalpinx has resulted in perforation-peritonitis, or a more subacute diffuse or circumscribed purulent inflammation has developed. This may occur without any solution of continuity in the pyosalpinx.

In tuberculosis extirpation is indicated so long as it is possible without too great danger. This depends mainly on the restriction of the process to the tubes, ovary and immediate vicinity. The operation is contra-indicated if the tumor is large and movable with difficulty, if the ligament is distinctly nodular, thickened and rigid, even in the lower parts. It is also contra-indicated in the later stages of pulmonary phthisis or advanced tuberculosis of other organs, and consequent marked impairment of the general condition. We need not desist from the operation in moderate grades of peritoneal tuberculosis with secondary transudations. Very good results (usually only temporarily) are not infrequently observed after simple evacuation of the transudation. In coincident affection of the uterus we must decide upon vaginal extirpation, including the tubes. As a matter of course, the ligaments, under these circumstances, must be perfectly intact. Operations for tuberculous salpingitis seem to us to have a great future in store.

TECHNIQUE OF THE OPERATION.

Extirpation and drainage are the two principal methods.

Extirpation is indicated whenever it seems possible without too great danger and difficulty, *i.e.*, when there are no very firm surface adhesions or inter-ligamentary development of the tumor. Under such unfavorable circumstances drainage may be employed, particularly as it often secures very good results. The conditions are much more favorable than in ovarian tumors which are almost always proliferating neoplasms.

Extirpation of Tubal Tumors.—In the case of large tumors the method is similar to that in large ovarian tumors; in the smaller ones it resembles castration. The ovary should always be removed if this can be done without any marked increase of danger.

In rare instances hydrosalpinx is so large that it must be emptied and diminished in size before removal. As its contents are not very noxious, not much harm is done if some of the fluid enters the abdominal cavity. Matters are different in cases of pyosalpinx, but this is rarely so large as to require preliminary evacuation. In the latter the incision should be made quite large and the contents not evacuated.

But this does not always afford sufficient protection inasmuch as the tumor may rupture, even after careful manipulations. This danger also obtains in smaller tumors and can not always be avoided, because the funnel of the tube must often be separated from its point of adhesion and is thus occasionally opened. It is a remarkable fact that such an escape of apparently very noxious purulent contents occasionally is not followed by bad results (Gusserow). The so-called pus has very different qualities according to its origin, and we suspect that the occasionally fluid and pus-like contents of tubercular salpingitis possess no specially poisonous properties. At all events more attention must be paid to these differences in origin than hitherto, when all forms of pyosalpinx were regarded as one. The question as to what to do when a suspicious fluid has escaped into the abdominal cavity, cannot be answered completely for the present. Much depends upon other circumstances, for example, the duration of the operation, the degree of operative trauma induced by the greater or less difficulties. If the discharge is not large in amount and the parts with which it has come in contact can be washed or kept in contact with iodoform gauze for some time, if the pus has a benign appearance and no foul smell, if the operation has not lasted long, the hemorrhage is completely checked and not too much torn tissue is present, then the abdominal cavity may be entirely closed. Under other conditions drainage appears necessary. Drainage after salpingotomy must also be performed after acute perforation-peritonitis resulting from rupture of a pyosalpinx.

The often extremely firm and extensive adhesions to the omentum, mesentery and intestines are treated according to the same rules as in the laparotomies previously considered. The greatest difficulties are generally encountered in the pelvis where the adhesions to the bladder, uterus, pelvic walls and broad ligaments can often be separated with the knife alone or the tumor must be removed in the dark on account of the impossibility of complete exposure despite eventration, Freund's position and nicking of the recti. Apart from the recommendations made under the head of castration we may add the following: If the difficulty is discovered after making the abdominal incision, the tumor should be drawn, if possible, into the incision, fastened to the edges of the wound, opened and drained. Pieces of the wall may be excised and drainage then performed. If the tumor cannot be drawn into the wound, it is best to desist from the operation and to close the wound. But if the sac has been opened and the attempt made to separate it from surrounding parts, we must attempt to finish the operation whenever possible. Larger or smaller portions of the wall will then be left behind or the bed of the tumor filled with torn tissue, so that the condition is practically the same. Under such circumstances drainage is indicated so much the more because, in addition to the evils mentioned, the contents of the sac are discharged and the hemorrhage can hardly ever be checked completely.

Martin perforates the fornix, for purposes of drainage, and introduces a ⊤ shaped rubber tube, which is passed through the vagina. He attempts to close the cavity towards the peritoneal cavity by employing as a roof the edges of the wound in the peritoneum (in inter-ligamentary development) or the portions of the peritoneum adjacent to the bed of the tumor—for example, the broad ligament. We have successfully employed Hegar's capillary drainage with glass or rubber tubes and iodoform gauze. Hegar has recently perforated the lateral part of the posterior fornix, dilated the opening with a volsella, and then inserted a strip of iodoform gauze. Douglas's sac, and especially that portion of the posterior layer of the broad ligament from which the tubercular tube had been removed, were stuffed with the coiled-up strip of gauze, upon which the intestines rested. At the end of the second day the long strip was gradually removed. The idea of this procedure was suggested by the good results obtained in vaginal extirpation of the uterus from the simple introduction of a thick strip of iodoform gauze into Douglas's sac.

But as a general thing we think that operations of this kind are no longer indicated in very firm and extensive adhesions or inter-ligamentary development of the tumor. At the utmost they may be risked in circumscribed tuberculosis, when we may hope to remove all morbid products. Further rules for such complicated procedures are formulated with difficulty. Even the extra-peritoneal treatment of the pedicle may be considered. In the case just mentioned the left tube had been peeled out of the broad ligament. On the right side was a tumor as large as an orange, consisting of the dilated, convoluted tube, the ovary, and masses of exudation. It was round, and after the other adhesions had been separated, was still inseparable at the anterior surface and right tubal border of the uterus, over an area as large as a two-mark piece. It was necessary to pass elastic ligatures through the uterus itself. Upon section the pedicle was found infiltrated with cheesy masses to such an extent that its reposition could not be thought of. The pedicle (right pars keratina of the uterus) was treated in the same way as in supra-vaginal amputation of the uterus in cases of myoma.

Drainage of the Tubal Sac.—The anterior abdominal wall and the posterior or lateral fornix of the vagina are the points of departure. Whenever possible both parts should be employed at the same time. Recovery is facilitated to a remarkable degree by a counter-opening.

Drainage through the abdomen is only possible when the tumor projects above the pelvis. As a general thing a segment of the tumor is found laterally above the horizontal ramus of the pubis, more rarely in the middle (only when the tumor is very large). The incision must therefore be made on the side, parallel to Poupart's ligament. If an adhesion is present, the sac may be opened forthwith. Otherwise two plans may be pursued. A strip of iodoform gauze is placed in the wound, covered with an antiseptic dressing, and 5 to 8 days allowed to elapse. A sufficiently firm adhesion to the parietal peritoneum is usually present at the end of that time. This does not always form directly, *i.e.*, in such a manner that the wall of the tumor is directly adherent to the peritoneum. But the peritoneal cavity is excluded, if it is only by the omentum or by the intestines with their adherent and thickened serous layer. We have obtained sufficient exclusion of the peritoneal cavity in this way, even if, after opening the abdomen, a loop of intestine lay between the tumor and abdominal wall. This was shoved to one side and a small ball of iodoform gauze placed in its stead.

If the tumor is situated immediately upon the inner surface of the abdominal walls or can be readily brought into such a position, for example, by the finger of the assistant introduced into the vagina, it may be stitched forthwith to the edges of the wound. Care must be taken that the serous covering of the sac comes in contact with the parietal peritoneum. The passage of the contents of the sac into the abdominal cavity is prevented with difficulty, even if round and narrow needles are employed. In hydrosalpinx the consequent danger is not great; in pyosalpinx it may be followed by very serious consequences. If we suspect that the contents are infectious, it is best to stuff the parts with iodoform gauze. The sutures may then be introduced later. In one case we discovered upon the surface of the tumor a ridge which, originally lying flat upon the wall, could be raised with a pair of forceps. We passed the sutures through this ridge and then drew the sac firmly against the abdominal walls; the incision into the sac was made after the lapse of a few days.

The vaginal incision is easy if the sac is situated at the bottom of Douglas's sac, and can be reached through the posterior fornix, directly behind the cervix uteri. No special danger is encountered, even if the peritoneum and sub-peritoneal tissue are thickened, as no large vessels are met with. It is best to dissect in layers, a similar method being employed in vaginal extirpation of the uterus; spirting vessels should be ligatured. The tumor is generally though not always adherent to the peritoneum; these adhesions may be very loose. The condition of things is easily recognized by the introduction of the finger. If there are no adhesions, iodoform gauze may be inserted and we may wait 4 to 5 days.

The lateral incision requires greater caution, but can hardly be avoided if the tumor is situated decidedly on one side. The fornix is exposed with a Sims speculum (a depresser being employed, if necessary), the portio vaginalis grasped with a volsella and drawn strongly towards the side opposite to that of the incision, and, at the same time, a little downwards. If, from a point corresponding to a commissure of the os uteri, an incision is made to the side, and, at the same time, a little posteriorly, the uterine artery or its main branches are encountered at a depth of 1 to 2 cm. and at a distance of 4 to 5 cm. (when the vaginal wall is very tense) to the side of the cervix. It is best to ligate and then pass, as much as possible with blunt instruments, to the median side of the point of ligature as far as the tumor. Considerable obstruction may be produced by great thickness of the tubal sac, peritoneum and connective tissue. The wound gradually grows very deep and the field of vision very much obstructed. Fortunately it often happens that we may reach the tumor more easily either through the abdominal walls or the vagina. The first incision may then be made in the more favorable locality, and a perforation in the other direction made (from the sac) with a trocar or blunt instrument. If necessary, the abdominal wall or vagina is prepared by an incision, stuffing with iodoform gauze, and stitching of the sac to the part

When the walls of the pus sac possess considerable thickness, the conditions are very unfavorable if we can reach it from one side alone. If the dissection in layers must be discontinued, and an advance with blunt instruments seems no longer justifiable, we must resort to the trocar, using a narrow instrument. After the sac has thus been opened, the opening is dilated with a blunt instrument, preferably with Hegar's cervix dilators.

We have not employed drainage in the tubercular form of pyosalpinx, but we would not fear this mode of operation if the entire tube or a portion presented fluid contents, and extirpation were impossible. Subsequent stuffing with iodoform gauze would then be advisable. The opening of the peritoneal cavity through the posterior fornix, evacuation of the fluid, and the subsequent introduction of iodoform gauze, and drainage of Douglas's sac would perhaps be advisable in tubercular processes of the ligaments and uterine appendages, associated with free or encapsulated transudations that can be reached through Douglas's sac, but are not suitable for extirpation.

Drainage of tubal tumors in the manner just described is not a very dangerous operation. We have performed it in recent and old cases without any fatal results. The only accident was the production of an intestinal fistula, which was owing undoubtedly to the too prolonged introduction of a thick drainage tube. This had been passed not alone through the pyosalpinx, but also through the adjacent encapsulated peritoneal exudation. Such accidents may be guarded against by exchanging the thick tubes for thin, soft ones, and the occasional use of horse-hair drainage, which, if necessary, may again be exchanged for a tube. Tincture of iodine may be injected occasionally into the cavity in order to hasten recovery.

Hegar performed extirpation of gonorrhæal pyosalpinx in 13 cases with two fatal results. Kaltenbach recently performed 4 successful salpingotomies. Tait has had remarkably good results in pyosalpinx (62 operations without a single fatal result). From the recent successful extirpations, especially those performed by Hegar in gonorrhœal and tubercular salpingitis, the operation does not appear to be as dangerous as it seems. The success as regards relief of the symptoms is also good. But we cannot say, with Tait, that "I know of only one case, which has not been cured of all her suffering." Such results are not to be expected. When the changes in the pelvic peritoneum and cellular tissue, such as are commonly found in pyosalpinx, are present, we may be satisfied with very marked improvement and with the subsequent cessation of the most annoying symptoms. These persist occasionally for one to two years. Thus, one of our first cases suffered for two years from the well-known distressing pains, which resemble uterine colic. Certain annoying symptoms may remain permanently. Better results would probably be obtained by earlier operation.

Apart from Hegar's cases only one case has been reported (Mandach) of extirpation of a tuberculous tube. The left kidney, which was also tuberculous, had been extirpated two years previously. The results of the castration and salpingotomy were not very favorable. The menses returned, and with them the symptoms, though to a less severe extent.

Hegar has operated in six cases of tuberculosis with one fatal result. The first operation was performed in May, 1883, and the only notes obtained date from October of the same year. The menopause had set in; the pains in the back, which had been very severe, were considerably relieved; the general nutrition was good. On the other hand the pains in the abdomen and the discharge still continued. Nevertheless, her condition was such that she emigrated to America. In another patient the symptoms disappeared almost entirely for six months, but the menses then returned and with them almost all the former symptoms, particularly great exhaustion. At the present time (two years after the operation) the condition is again improved; the lungs are not intact.

The four other operations are too recent to permit an opinion with regard to their success. But a surprising fact is the rapid convalescence, despite very difficult and in part complicated operations.

CHAPTER II.

OPERATIONS ON THE UTERUS.

TOTAL EXTIRPATION OF THE UTERUS.

HISTORY OF THE OPERATION.

THE ancient reports of total extirpation of the uterus "in necrotic and gangrenous prolapse," probably refer exclusively to the removal of necrotic neoplasms, or inversions which protrude from the vagina. In 1600, Schenk of Grafenberg collated twenty-six cases. But the little value that can be attached to these cases is best shown by the statement made that the women, whose uterus had been removed, subsequently menstruated, conceived and gave birth to children. In 1852 Breslau collected fifty-six cases of total extirpation of the uterus, performed in this century, but only a few of these can be regarded as total extirpations in the modern sense. The majority of the operations were removals of inversions, partial extirpations of the uterus through the vagina or abdominal walls, and finally unintentional injuries, inflicted during delivery by rough, ignorant obstetricians and midwives.[1] The real history of the operation begins at the time when precise indications were formulated, and the operation performed according to a well-devised plan.

If we leave out of consideration the inversions of the uterus, which will be discussed in a separate chapter, total extirpation of the uterus has been performed almost exclusively in malignant tumors, and very rarely in simple prolapse. Wrisberg and Monteggia first recommended total extirpation in cancer of the uterus. The first operations of this kind

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[1] However little the term "operation" may be applied to the cutting off or tearing out of an inverted uterus or one which has remained *in situ*, through a vaginal or cervical rent, nevertheless the six reported cases of recovery (referred to in Arch. f. Gynack. XV.), are instructive in several ways. A notable feature in several cases is the very slight hemorrhage; this is attributable, apart from the application of blunt force, to the flexion and torsion of the vessels of the uterus, which was either inverted or had toppled backwards behind a cervical rent. Furthermore, the patency of the peritoneal wound favored a sort of natural drainage

(Marschall in 1783, and Langenbeck in 1813) were performed on prolapsed uteri, and, strictly speaking, were not total extirpations. Furthermore, the diagnosis of cancer appears doubtful in both cases. But Langenbeck's successful operation exerted great influence, and his method of sub-peritoneal enucleation of the uterus long dominated the opinions of his followers.[1] In 1814 Gutberlet recommended the following method of extirpation of the uterus through the abdominal walls: After the abdominal cavity has been opened in the linea alba, the oiled hand of an assistant is introduced, and pushes the intestines away from the pelvic viscera. Another assistant passes a hollow instrument, shaped like a saucer, into the vagina, in such a way that the portio vaginalis is received into the cavity of the instrument, and the connections of the uterus with adjacent organs are stretched. These connections are then cut with a scalpel, through the abdominal opening, the assistant meanwhile compressing the iliac arteries until the vessels are tied.

In 1822 Sauter performed the first extirpation of a cancerous uterus *in situ* through the vagina. He first separated the fornix from the uterus and then attempted to enucleate the uterus from its peritoneum. This proved unsuccessful and the bladder was injured. He then opened into the anterior peritoneal fossa, and divided the lateral connections of the uterus with the tubes and broad ligaments. He then grasped the fundus with the hand, turned it over, and separated its last connections with the posterior fornix. The intestines were replaced, and the vagina tamponed with charpie; not more than one and a half pounds of blood was lost. The patient recovered completely, but died four months later of pulmonary œdema. At the autopsy the cut fornix was found contracted concentrically; a loop of intestine was adherent to the surface next to the peritoneal cavity; the abdominal organs were healthy.

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[1] Langenbeck describes the operation in the following terms: "I now come to that portion of the uterus, which, seen from the front, was inserted into the peritoneum as into a cloth. I also separated very accurately the substance of the uterus from the peritoneum, without cutting it, because otherwise the intestines might have protruded, and constantly drew the uterus out. I continued this separation to the upper rounded border of the fundus uteri, and then cut the uterus out of the peritoneum in such a way that a small piece, which seemed to be perfectly healthy, remained connected with the peritoneum. This was consequently a true enucleation of the uterus out of the peritoneum, so that the latter, in connection with the vagina, formed an empty bag." The severe hemorrhage was checked by ligatures. The ovaries, which Langenbeck thought he had removed, were found at the autopsy.

Récamier's much more perfect method (1829) is distinguished from that of Sauter by the fact that, after opening the anterior peritoneal fossa, the upper two thirds of the broad ligament alone were removed, but the lower third and uterine artery were grasped between the index finger and thumb and ligated. The hemorrhage was slight. Removal of ligatures on the tenth day. In 1830, Delpech recommended a combination of the hypogastric and vaginal methods

But it remained for Freund to raise the question of total extirpation of the uterus from the stage of rather rough empirical experiments to a really scientific basis. In 1838 he devised an operation which renders it possible to guard against hemorrhage and injury to adjacent parts, and to secure closure of the peritoneal wound. He operated through the abdominal walls. The first results obtained by this method were so successful that it was even hoped to effect a radical cure. In the very nature of the case such expectations could not be fulfilled, and the danger of the operation was proven to be too great for merely palliative benefits. Nevertheless to Freund belongs the credit of having given a decided impetus to the revival of operative treatment of cancer of the uterus.

Billroth, Czerny and Schroeder have recently performed the Sauter-Récamier vaginal operation with such success that this at once obtained precedence over the abdominal method. The operative treatment of uterine cancer has thus entered a new phase of development, and must be viewed from approximately the same standpoints as operations for cancer in other parts of the body.

METHODS OF TOTAL EXTIRPATION OF THE UTERUS.

I. Extirpation through the Abdominal Walls.—Freund's Operation.

Preparation of the Patient.—In order to secure exposure of the field of operation, Freund attaches special importance to complete evacuation of the bowels. This is effected by concentrated food, laxatives and subnitrate of bismuth. The vagina is disinfected by antiseptic irrigations or the application of a ten per cent. solution of carbolic acid to the new growth. Loose shreds of cancer are first destroyed with the curette or actual cautery, and the cervix is amputated if its size gives rise to inconvenience. The patient is placed in such a position that the upper half of the body, which is directed towards a window, is situated lower than the pelvis and lower limbs. The angle between the spine and the plane of the superior strait is thus enlarged, and a better view of the pelvic cavity rendered possible.

The incision, which begins below the umbilicus, is carried along the linea alba to the shaven mons veneris. In the lower angle of the wound the peritoneum is stitched to the abdominal walls by two or three provisional sutures. Otherwise it is apt to separate to a great extent on account of the loose character of the sub-serous cellular tissue. By means of these sutures the bladder is also pushed against the symphysis, the uterus drawn somewhat forwards, and the lower angle of the wound rendered freely accessible.

If the intestines are empty and collapsed, they will usually sink spontaneously towards the upper part of the abdominal cavity, or are readily kept there by means of cloths. If this is impossible on account of tympanites or the unyielding character of the abdominal walls, Freund advises that the intestines be placed in warm, well-disinfected cloths upon the outside of the abdominal walls. The accessibility of the pelvic cavity is increased very considerably in such cases, by cutting transversely through the tense recti immediately above their insertion into the pubis (tenotomy of the recti).[1] In order to secure free accessibility of the field of operation, particularly the base of the broad ligament from below, preliminary colpeurysis has been employed if the vagina was narrow and rigid, or the ampullary portion of the rectum distended during the operation, by means of a colpeurynter filled with water.

After exposure of the field of operation, the body of the uterus is drawn out by passing a loop of thread through it, or, if the walls are degenerated and softened, by means of fenestrated clamp-forceps. Ligature of the broad ligaments on both sides in three portions is next performed. In ligaturing the right ligament, the uterus is directed towards the left side and above, and a needle, armed with a long double thread, is passed from the posterior surface of the broad ligament through the ovarian ligament; then the anterior end of one thread is passed through the tube, the other end of the other thread through the round ligament. The like procedure is adopted on the other side, the uterus being directed towards the right and upwards. Next the two loops are firmly fastened on both sides, and the long ends of the threads are pulled upwards and outwards by assistants. Both lower loops, which encircle the uterine arteries, are applied by means of a long trocar needle (Fig. 130), which can be pushed through the middle ring of the canula, and then, when left to itself, springs back into the canula. This is introduced, when unarmed, through the vaginal fornix at the anterior internal border of the broad ligament, into the anterior pelvic peritoneal cavity, which is exposed by the marked elevation and backward displacement of the uterus. This procedure is very much facilitated by placing a cork, against which the trocar is pressed from below, upon that part of the peritoneum which is to be perforated. Now the needle is threaded, the armed needle then springs back, and is pushed through the posterior lateral compartment in front of Douglas's sac at the posterior, internal part of the broad ligament, the uterus being drawn upwards and forwards; the threads must be drawn out to a sufficient length. The uterine artery, which can be felt on bi-manual exami-

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[1] Credé has even recommended and performed partial resection of the anterior wall of the pelvis as a preliminary to Freund's operation, in order to facilitate exposure of the parts.

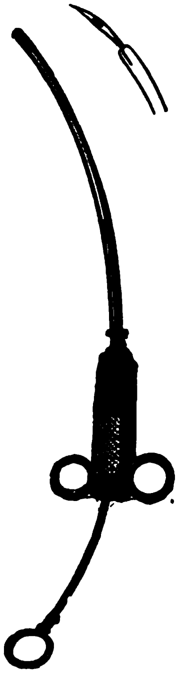
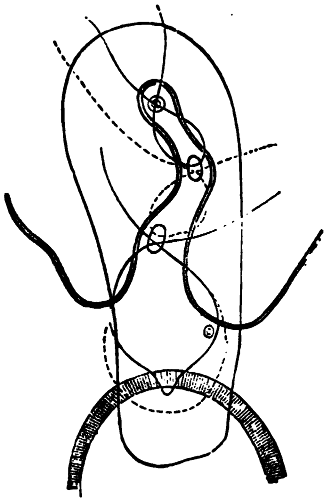


FIG. 130.



nation, furnishes the most certain starting-point as regards the part to be perforated. The same procedure is adopted on the other side, and then the posterior end of the thread of each of these loops is threaded into an ordinary needle with handle, passed anteriorly through the opening of insertion of the second loop situated at the round ligament, and finally tied as firmly as possible. As Freund observed on several occasions that the tying of the ligatures met with difficulty on account of elastic resistance, and that the uterine artery occasionally bled more or less after removal of the uterus, despite the lower loop, he made both openings of insertion in the lateral compartment as close together as possible, and caused the canal of insertion of the needles to diverge strongly anteriorly and superiorly, and posteriorly and superiorly. Fig. 131 shows the various situations of the ligatures according to the earlier and later methods.

In excising the uterus a horizontal incision through the peritoneum is made on the anterior surface of the uterus two cm. above the boundary of the bladder, as shown by the catheter, and is prolonged upwards in the shape of an arch towards the broad ligaments on the median side of the lower loops. The posterior peritoneal covering of the uterus is divided in a similar manner, except that the horizontal incision is deeper than the anterior one, about 2 to 3 cm. above the deepest portion of Douglas's sac. The anterior and posterior peritoneal edges are fastened by a series of silk sutures, which greatly facilitate the application of the subsequent peritoneal sutures. Starting from this incision, the cellular tissue surrounding the anterior and posterior circumference of the cervix as far as the fornix is separated, at first with the blade of the scalpel, later with the fingers. The fornix of the vagina appears as a yellowish red fold at the base of the wound; it is perforated, from the vagina, by means of a covered, curved knife, and the opening is dilated towards both sides. Then one or two fingers of the left hand are passed from above through the opening in the fornix into the os uteri, and draw the portio vaginalis, which is gradually separated from its connections with the vagina, upward into the pelvis. By drawing up the uterus the separation of the fornix is considerably facilitated, and we are able to avoid cutting the lower ligatures, which are then in sight. At the same time any hemorrhage from a small, cut vessel, which would be very annoying at this time, is entirely or almost entirely prevented by torsion of the cervix uteri. Instead of a probe-pointed bistoury we may employ, in cutting out the uterus, a pair of scissors which is curved on the flat and at the same time on the edge. Hemorrhages from small arteries of the vaginal walls or the ligaments, are checked by torsion or ligature. The six loops of ligatures are drawn through the vagina, and, by strong traction on both upper pairs of loops, the stumps of the broad ligaments are inverted downwards. Now the edges of the peritoneal wound are closed with a transverse suture, the previously applied fixation loops being also utilized. Freund passes the outermost loops through both peritoneal edges and through the lining of the tubes and ovaries; if the latter are removed, only through the covering of the tubes and over the ovarian stump, in order to effect a more complete and certain closure of the peritoneal cavity. Freund attaches great importance to the inversion of the broad ligaments, in order to secure a partly solid substitute for the lost middle portion between the bladder and rectum.

After the termination of the peritoneal toilette and closure of the abdominal wound, Freund pushed into the vagina a piece of linen dipped in a ten per cent. solution of carbolic acid. Antiseptic irrigations of the vagina were subsequently performed as required, and the ligatures were removed by slight traction at the end of fourteen to eighteen days.

Freund's original method was modified considerably by Bardenheuer, the improvements being accepted by Freund himself. Bardenheuer separates the uterus before opening the abdominal cavity, by cutting it through the vaginal fornix. In this way the uterus becomes so movable, as was shown by Freund in experiments on dead bodies, that it may be drawn above the symphysis (after opening the abdominal cavity) and removed like a tumor. If slowly performed, the larger vessels of the broad ligaments may be ligatured separately before they are cut.

If Freund's clamp-forceps are used in withdrawing the uterus, it is emptied of blood, and no ligatures need be applied on the median aspect. This shortens materially the duration of the operation. The ureters become visible and may be certainly avoided. It is said that it is even possible to remove cancerous nodules and glands from the opened parametrium.

The chief feature of Bardenheuer's modifications consists in leaving open the abdominal cavity towards the vagina. The difficulty or impossibility of exact hæmostasis and disinfection in the abdominal cavity, compels us to adhere to the principle of drainage in ventral total extirpation.

But we may resort to much simpler methods of drainage than those described by Bardenheuer. In Fig. 132 is shown his first drainage tube with its two intra-peritoneal transverse arms. The individual portions of the tube had a diameter of one cm.; the closed vaginal portion served for intra-peritoneal injections. The passage of blood and secretion towards the vagina was facilitated by a firm abdominal bandage and elevation of the trunk.

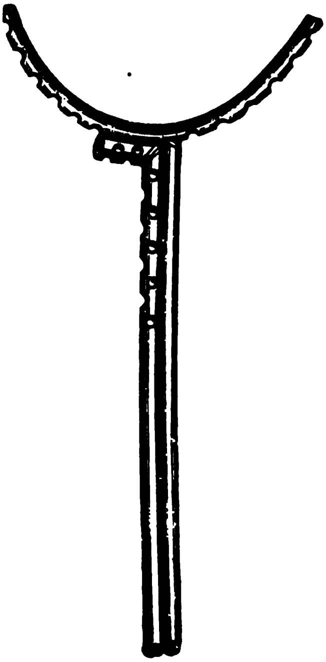


FIG. 132.

EXTIRPATION FROM THE VAGINA.

a. *Uterus in Situ.*

It is difficult to give a coherent description of the operation, because no thoroughly definite methods have been hitherto adopted. Not alone do the operators differ with one another in regard to the individual acts of the operation, but they are constantly changing their own technique.

The remarks made above hold good with regard to the preliminary treatment of the patient. The greatest importance is to be attached to careful cleansing and disinfection of the entire field of operation by irrigations with corrosive sublimate, iodoform dressings, and removal of gangrenous parts of the tumor

The breech-dorsal position is generally regarded as the most convenient. At the same time we may use Fritcsh's leg supports, or the assistant on either side of the patient place her leg across their shoulder, so that both hands are kept free for further assistance.

The disinfection of the field of operation is secured by frequently touching the raw surface with concentrated antiseptics, or by interrupted irrigations with strongly diluted antiseptics (1:1000 to 10:000 corrosive sublimate). Permanent irrigation is sometimes distressing and is very apt to give rise to poisoning, on account of the long duration of the operation, especially after the peritoneal cavity has been opened.

First Stage.—Incision through the Vaginal Fornix.—Opening of Douglas's sac.—The posterior vaginal wall is pushed back with a short, broad-bladed speculum. Two lateral depressors expose the fornix vaginæ. The portio vaginalis is drawn, with a tenaculum, strongly forwards towards the symphysis, and the posterior fornix, which is thus made tense, is cut through transversely, opening into Douglas's sac. A protecting sponge is shoved forthwith through the peritoneal wound. Bleeding vessels of the fornix are closed by ligatures. Martin stitches the entire vaginal wall by transverse sutures which include the peritoneum (Fig. 133). The hemorrhage from the cut surface of the uterus is also checked by ligature, if possible with a single transverse suture.

Next, the anterior fornix of the vagina is exposed by the aid of a vaginal depressor and by drawing the portio vaginalis backwards, and is then cut through beyond the border of the neoplasm. The two semi-lunar incisions in the anterior and posterior fornix unite laterally at a somewhat more acute angle. The uterus is made more movable by this circular division of the fornix, it can be withdrawn farther, and we can generally succeed then in inserting the tenaculum into healthy, firmer parts of the supra-vaginal cervix.

Second Stage.—Separation of the Cervix laterally and anteriorly as far as the Isthmus.—In order to separate the uterus from its lateral connections with the parametrium, it is drawn strongly to the side and the tense bundles of tissue which run obliquely from above and externally downwards and internally, are stitched with stout silk ligatures. These bundles of tissue contain thick venous plexuses, the main branches, and, higher up near the internal orifice, the trunk of the uterine artery. The ligature of these vessels is greatly facilitated by the counter-pressure of the index finger, which has been introduced into Douglas's sac, and which directly feels the more strongly pulsating vessels. These ligatures are tied as far as possible to the side, while the uterus is separated with the scissors or knife on their median side. Previous ligature towards the uterus is unnecessary, because the hemorrhage from the lateral borders of the organ is usually slight, on account of the marked torsion and stretching of the vessels. If the ligatures are applied step by step, the hemorrhage from the parametrium is rarely marked, provided the ligatures are carefully tied, and that we do not cut more tissue on their internal aspect than has been ligatured. But, at all events, the bleeding places may be made freely accessible to ligaturing, by drawing out the uterus, inasmuch as they can not slip back. In many cases we can grasp the trunk of the uterine artery in the cut surface, and ligate it separately. After the cervix has been set free in this manner for a certain distance on both sides, the bladder is separated from the anterior wall of the uterus,

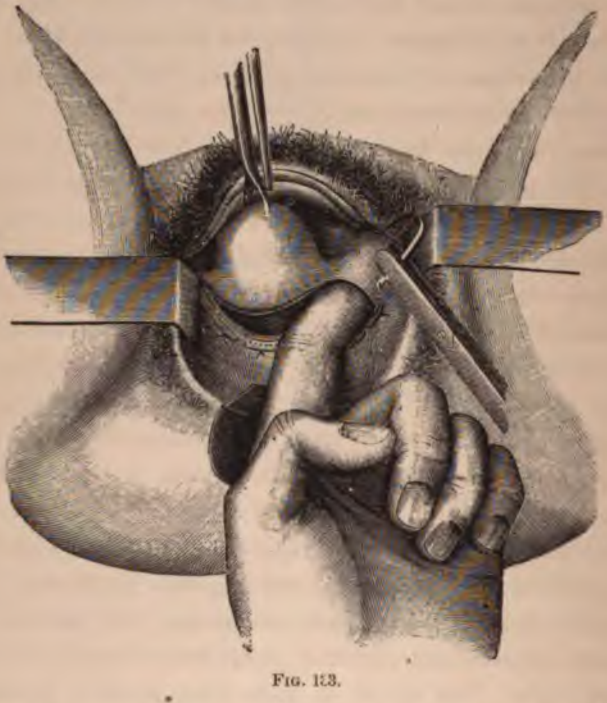


FIG. 123.

by means of the finger, which is inserted from the side. Tense bundles of tissue are cut through, after previous ligature. The separation of the uterus from the bladder must be done very carefully, and sometimes requires control with the catheter. Ligatures are applied at once to bleeding places.

Third Stage.—Opening of the Vesico-uterine Fossa.—If the uterus has been separated on all sides to the level of the isthmus, the part at which the peritoneum bends over in the vesico-uterine fossa must be divided. Its height varies extremely, *viz.*, from 1½ to 4½ cm. above the insertion of the vagina. The peritoneum, which projects as a thin membrane, is grasped with a pair of forceps, and a small opening is first made. Or the uterus is grasped from Douglas's sac with two fingers, which are passed over the fundus and upper border of the broad ligaments, and upon these the projecting peritoneum is incised along the entire breadth of the vesico-uterine fossa.

Fourth Stage.—Ligature of the Broad Ligament.—The uterus is now connected merely with the upper half of the broad ligaments. These may be grasped and ligatured as wholes or in parts. This manipulation is facilitated by pulling the body of the uterus backwards through Douglas's sac, or forwards through the vesico-uterine fossa. If this is done after the cervix has been separated to a sufficient height, no further aid is required than the application of successively higher tenacula.[1] The twisted ligaments are thus made conveniently accessible. and may be ligated at any suitable place. We have generally employed an elastic ligature *en masse*, but have applied some partial silk ligatures for further security, after the uterus, with a sufficiently long pedicle, has been excised. The ligature of the other broad ligament is greatly facilitated by the fact that the uterus can now be withdrawn much further.

The ovaries and tubes generally follow the ligaments spontaneously and may be tied separately without special difficulty. On the other side the ligatures can usually be applied forthwith behind the ovary. If the ovaries and tubes are firmly connected with the rim of the pelvis and are withdrawn with difficulty, we may dispense with their removal so much more readily because their retention is followed by notable symptoms only in exceptional cases and temporarily.

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[1] Martin formerly turned the uterus by introducing into its cavity a curved instrument with a club-shaped end, and also exposed Douglas's sac with a Sims speculum.

Fifth Stage.—Closure of the Peritoneal Wound.—Treatment of the Stump of the Ligaments and the Supra-vaginal Wound Surface.—Dressing.—The opinions entertained concerning the further treatment of the pelvic wound are very divergent. The majority of operators at first left the peritoneal cavity open, introduced a drainage tube, through which they even applied disinfectant irrigations. It cannot be denied that the objections to closure of the abdominal cavity in Freund's operation do not hold in the vaginal method. Hæmostasis is much more exact. Soiling of the abdominal cavity with blood or degenerated tumor elements can be avoided with tolerable certainty, even in cancer of the cervix; this is perfectly certain in cancer of the fundus or when the operation is performed on account of prolapse. If no decomposable fluid has entered the abdominal cavity, there is no reason for maintaining an open canal. On the other hand, drainage proves entirely useless, if we are unable to prevent the entrance of specific pathogenic fungi, since their diablastic properties will become dangerous even in the absence of material of decomposition. The main object seems to us to be to avoid subsequent soiling (by blood and wound secretion through the vagina) of the abdominal cavity, which has been thoroughly cleaned and disinfected before the close of the operation. This is effected most certainly by excluding the entire abdominal wound, with its ligated stumps of tissue and its trickling, bleeding surfaces, from the peritoneal cavity by accurate sutures of the peritoneum. Closure of the peritoneal wound is also indicated on account of the possible prolapse of the intestines. In old and feeble patients the intestines manifest but a slight tendency to prolapse. On the other hand we have found repeatedly in young and well-nourished individuals that prolapse of the omentum and intestines could only be prevented by peritoneal sutures.

Before applying these sutures the abdominal cavity is wiped with sponges (with holders) which have been dipped in corrosive sublimate (1:2000 to 1000). The excess of fluid is then removed by moist sponges which have been wrung out. During the application of the sutures a disinfected sponge is kept in the peritoneal cavity. Then the ligatured stumps are pulled down by means of the long ligatures or catch forceps, and every bleeding place is ligatured. Immediately adjacent to the ligatured stumps the anterior and posterior peritoneal walls are included in a suture, which after being tied, closely encircles the stumps, that have been turned downwards, and prevents their slipping back towards the abdominal cavity. The next suture may be passed through the peritoneum and peripheral end of the stump in order to obtain additional security. The middle of the transverse peritoneal opening is closed by a series of simple sutures, which include the edge of the peritoneum and a part of the supra-vaginal wound surface, and may even be passed, without disadvantage, through the wall of the bladder. After the peritoneal sutures are applied the entire supra-vaginal and parametral wound surface is washed with concentrated antiseptic fluids and a wad of iodoform gauze is placed in the vagina.

The after-treatment is purely symptomatic. The iodoform gauze is removed on the sixth or seventh day. Vaginal irrigations are not made unless the secretion is foul smelling. We do not allow the patients to leave the bed before the fourteenth day. In the course of the third week the sutures are removed, and the ligature stumps of the broad ligaments with the elastic ligatures can usually be removed on the sixteenth to eighteenth days by gentle traction.

We will now describe briefly the modifications of the operation under special circumstances, and at the same time mention the most important differences between the method just described and that of other operations.

First and Second Stages.—Olshausen and others delay opening Douglas's sac, as long as possible, because its early opening, as recommended particularly by Martin, is more apt to be followed by infection of the peritoneal cavity. This point is undoubtedly important in ulcerating carcinoma of the cervix. But it must be remembered, on the other hand, that the method previously described will prevent infection of the peritoneal cavity with tolerable certainty, and that the early opening of Douglas's sac greatly facilitates the ligature, step by step, of the parametral tissue.

Fritsch first separates the cervix on the sides because this is the situation of the largest vessels, and this manipulation renders the uterus more freely movable. The most bloody part of the operation is thus made before opening the peritoneal cavity. After ligature of the parametral tissues, the bladder is separated from the uterus and finally an incision is made through the posterior fornix of the vagina.

Schatz, on the other hand, delays the separation of the cervix from the bladder until the last, a plan which is justly charged with endangering the ureters, because it prevents their upward movement with the bladder.

In order to check the hemorrhage from large cauliflower growths, Fritsch applies an elastic ligature in the groove formed by cutting through the portio vaginalis. Mueller compresses the abdominal aorta during the operation.

Some physicians have used the galvano-caustic knife or thermo-cautery to separate the portio vaginalis, and in part the parametrium and broad ligaments. But this plan interferes with our recognition of the anatomical relations, and, in addition, the hæmostasis is not certain. Simpson lost a patient, eighteen hours after the operation, from secondary hemorrhage from an eschar in Douglas's cavity.

If the vagina is very narrow, virginal, or in a condition of senile involution, longitudinal incisions of the vaginal walls as far as the fornix, and lateral incisions in the perineum, may become necessary, in order to increase the accessibility of the field of operation. Annular folds in the fornix, which prevent the introduction of the exploring instruments as far as the tumor, are particularly annoying.

Brennecke has devised a special instrument for drawing down the uterus, to take the place of tenacula, which are apt to tear through if the cervix is brittle. The instrument takes a hold upon the inner surface on the healthy body of the uterus. Its club-shaped end is inserted into the uterine cavity and the two transverse branches project on the sides.

After applying a provisional ligature *en masse* Mueller suggests that the parametral tissues be rendered more accessible to ligatures by dividing the cervix into two vertical halves. The idea is a happy one, but malignant tumors should not be laid open deeply except in cases of absolute necessity, because this exposes the patient to the danger of infection or severe hemorrhage from the cut surfaces

Third and Fourth Stages.—Olshausen perforates the peritoneum between the bladder and uterus with the blunt end of a closed cooper's scissors and employs variously curved aneurysm needles for passing the elastic ligatures around the broad ligaments.

For the purpose of facilitating ligature of the broad ligaments Billroth and Schatz have devised clamp forceps, which permit secure perforation and ligature of the grasped part anteriorly and posteriorly.

Since the ligature of the parametral tissues step by step has been perfected, the same importance as formerly is no longer attached to the tilting of the uterus in order to secure greater accessibility of the ligaments. Billroth and others operate *in situ* or after pulling the uterus forcibly downwards. Tilting of the uterus anteriorly is generally preferable, since it constitutes an exaggeration of normal ante-flexion. The body of the uterus is displaced to a less extent than in posterior tilting, which may be opposed by greater resistance on the part of the round ligaments. But in no event may the diseased cervix be pushed up behind the symphysis in posterior tilting, since this is apt to soil the peritoneal cavity.

Schatz stitches the vagina from the uterus by a series of chain sutures, and also employs them in tying the broad ligaments.

Fifth Stage.—The most important question is, shall the peritoneal cavity be closed or not. The answer to this question will vary, according as we regard it possible to cleanse the peritoneal cavity completely at the close of the operation or not. Whoever regards this as possible, must carefully close the cavity in order to prevent subsequent infection from the outside. When the after-trickling of blood and secretion is mentioned as an indication for drainage of the abdominal cavity, a sufficiently sharp distinction is not made, in many cases, between drainage of the abdominal cavity and drainage of the supra-vaginal pelvic wound. As a rule, there is absolutely no trickling from the cleaned and closed peritoneal cavity, if the stumps of the ligaments are everted. But this takes place from the large parametral wound cavities and the latter must be kept open for the escape of secretion. We would keep the abdominal cavity open in those cases alone in which thoroughly cleansing failed, or bleeding surfaces remained in the cavity after the separation of adhesions.

On the whole, operators are discarding drainage more and more, and are inclining towards partial or complete closure of the peritoneum. Intra-peritoneal irrigations during the after-treatment have been universally abandoned. Among the operators of large experience, Martin appears to be the only one who regularly introduces a drainage tube with transverse branches. He removes it on the third to fourth day, at which time "a peculiar dragging feeling appears in the umbilical region." Schroeder sews the peritoneum and even the vagina laterally, after eversion of the stumps of the ligaments, and merely leaves an opening in the middle for the drainage tube. Czerny, on the other hand, merely unites the peritoneum by a few stitches in the middle. Fritsch and Olshausen leave the peritoneal wound entirely open, and effect drainage by the introduction of iodoform gauze within the vagina. Some operators, who leave the abdominal cavity open, endeavor to diminish the secreting supra-vaginal wound surface by stitching the peritoneum to the edges of the vaginal fornix.

Kaltenbach, Mikulicz and others, favor complete closure of the peritoneal wound with sutures. Kaltenbach did this in eight cases of vaginal total extirpation, all of which terminated in recovery. In six cases he closed the peritoneum entirely, in two cases he left a small central opening for the drainage tube which was removed on the fifth day. In the latter drainage seemed to be unnecessary. In one nothing escaped, in the other only a few drops of foul-smelling, brownish fluid. The fluid seemed to be owing to the presence of the drainage tube, since recovery was unattended with fever. Schede closes the peritoneum hermetically by a continuous catgut suture. Of his twelve patients, only one died, of collapse, after a very difficult operation.

Tauffer properly claims that the peritoneal suture tends to prevent the formation of adhesions of the intestines to Douglas's sac and the cicatrix of the vaginal wound.

We do not share in the technical objections to peritoneal suture entertained by Czerny and Fritsch. We think that it is easy in every case to unite the anterior and posterior peritoneal edges in such a manner that it may be securely closed against the supra-vaginal wound surface. More is unnecessary.

Langenbeck's old method of enucleation of the uterus from its peritoneal covering has also been performed repeatedly in recent times. Thus, Lane, after cutting through the vaginal fornix, enucleated the entire cancerous uterus, 10.5 cm. in length, with blunt scissors and the index finger, the operation being controlled through the bladder and rectum. About a dozen vessels were ligated The uninjured peritoneum was nearly as thin as wet tissue paper, and was distended and collapsed by the movements of respiration. It was washed with a two per cent. solution of carbolic acid, and a sponge dipped in this solution was introduced. The patient recovered.

Czerny also performed sub-peritoneal extirpation of a uterus suspected of cancer. The enucleation could only be effected after several incisions of the enveloping peritoneum. The patient recovered at the end of four weeks.

The conditions were essentially different in Henning's case, in which the fundus uteri and its peritoneal covering were enucleated out of an old adhesion callosity. Old peritonitic exudations had completely closed the abdominal cavity below.

Special value does not attach to this method. It is true that the entire carcinomatous cervix may sometimes be enucleated with blunt instruments without noteworthy hemorrhage. But superiorly the difficulties increase very materially, inasmuch as the connection of the peritoneum with the body of the uterus is loose in exceptional cases alone. Exact hæmostasis and asepsis of the large wound cavity are equally difficult.

b. *Uterus Prolapsed.*

Total extirpation of the prolapsed uterus is a very simple operation. It has been performed in simple prolapse, or carcinoma combined with prolapse.

The operation is entirely bloodless if the base of the prolapse is surrounded with an elastic ligature. The vaginal fornix is opened by a circular incision. Then a vertical incision is made directly upon the muscular wall of the cervix, and the latter is separated from surrounding parts, to the level of the isthmus, in the shape of a usually thin, cylindrical column. Then the anterior and posterior peritoneal fossæ are opened, the usually retroflexed fundus uteri is drawn down through Douglas's sac, and the twisted broad ligaments tied on both sides with several ligatures *en masse*, within which the uterus is excised, the stump being left as long as possible. The body of the uterus may be drawn down readily and without hemorrhage, even if it has been encircled by an elastic ligature from the start. The peritoneal wound is now closed with a transverse suture which also keeps the stumps of the ligaments turned out of the peritoneum. Hemorrhage from the base of the broad ligament, which was first incised, is prevented by grasping and tying the vessels lying free in the sides of the wound surfaces. In his first case Kaltenbach, at the beginning of the operation, applied ligatures to the supposed site of entrance of the uterine artery through the vagina. But inasmuch as partial resection of the vaginal fornix appears indicated in pronounced prolapse, the uterine artery may be ligatured after the excision of triangular flaps from the lateral part of the fornix. After removal of the elastic ligature and thorough hæmostasis, the supravaginal wound surface is washed with corrosive sublimate and stuffed loosely with iodoform gauze. It may sometimes be diminished in size to advantage by inserting a few stitches, which bring the edges of the excised fornix in contact.

In extirpation of the prolapsed uterus, Martin does not open Douglas's sac transversely but by a longitudinal incision which is at right angles to the posterior insertion of the vagina. Starting from this slit the sutures are applied to the posterior and lateral periphery, and finally anteriorly.

Results of Total Extirpation.

To the statistics of Freund's operation (93 cases) collated by us in 1881, 26 new cases may be added.

	Number of operations.	Recoveries.	Fatal cases.	Incomplete operations.
Previous Statistics	93	26	63	4
Zweifel	1	—	1	Hemorrhage.
Bischoff	1 (gravid uterus)	—	1	"
Miculicz-Billroth	2	—	2	Sepsis.
Kleinwächter	1	—	1	"
Olshausen	4	1	3	—
Reuss	1	1	—	—
Kispert	1	—	1	Sepsis.
Federico Rubio	1	—	1	—
Bantock	1	—	—	Result unknown.
Mac Cormac	1	1	—	—
Clinton Cushing	1	—	1	—
v. Mandach	1	1	—	—
Dunnet Spanton	1	—	1	—
Spencer Wells	1 (gravid uterus)	1	—	—
Jandrin	1	—	1	Shock.
Mason	1	—	1	Sepsis.
Fritsch	1	1	—	—
Freund	2 (1 case of sarcoma)	2	—	—
Schultze	3	—	3	Shock in the first 24 hours.
	119	34	80	

This gives a mortality of 67.2 per cent. In addition there were four incomplete operations and one case in which the result was unknown.

This table proves beyond question the extremely great danger to life of Freund's ventral method. The figures are not exhaustive, but, if anything, they are too favorable, as hardly any successful case will fail to be reported. Of those who survived only one patient (operated by Freund in 1878) was permanently cured. In all others, who were under observation for a sufficiently long period, relapses occurred after a longer or shorter interval.

Our experience concerning vaginal total extirpation is quite large, but the operation is so recent that a definite opinion cannot be formed on many points. In 1881 Olshausen collated 41 cases with 29 per cent. mortality; in three of these cases the operation was not performed on account of carcinoma. Sanger's statistics of 1883 includes 133 cancer operations with 28.6 per cent. mortality. In the same year Engstroem collated 157 cases with 66 deaths (29 per cent. mortality.)

We will now give the latest results of those physicians who have performed a large number of operations. It is evident from the following table that the operation has hardly spread beyond the boundaries of Germany.

Schroeder	34	operations	with	9	deaths.
Olshausen	32	"	"	7	"
Martin	60	"	"	13	"
Hahn	5	"	"	1	"
Czerny	8	"	"	3	"
Billroth-Miculicz . .	12	"	"	4	"
v. Teuffel	7	"	"	3	"
Tauffer	5	"	"	1	"
Schatz	10	"	"	3	"
Frankenhäuser-Kappeler .	10	"	"	3	"
Hegar	12	"	"	4	"
Freund	8	"	"	1	"
Kaltenbach . . .	8	"	"	—	
Fritsch	24	"	"	2	"
Howitz	6	"	"	4	"
Schede	12	"	"	1	"
Schultze	4	"	"	1	"
	257	operations	with	60	deaths (23 %).

These results are incomparably more favorable than those of Freund's operation, and the later results are even more favorable than the earlier statistics furnished by Olshausen, Sanger and Engstroem. The statistics would be even more favorable were they not burdened by the naturally unfavorable results of the pioneer operators.

The large majority of those who recovered from vaginal total extirpation suffered from relapses at a later period. But very satisfactory reports of late occurrence of relapses or of long-continued recovery have also been made. Among the cases at Schroeder's Clinic, reported by Hofmeier, three remained healthy at the end of two years. Of 16 patients upon whom Martin operated before the end of 1882, eight remained healthy at the end of 1884. Among Olshausen's cases four remained free from relapses 1 year 8 months, 1 year 11 months, 2 years 5 months, and 2 years 11 months, respectively. Among Kaltenbach's patients one remains in blooming health two years after the operation. These statements are very meagre, as is natural in an operation which was reintroduced only six years ago. They are hopeful, but do not permit any positive opinion as to the expectation of radical or palliative results

CRITICISM OF THE METHODS.—DANGERS OF TOTAL EXTIRPATION.—CAUSES OF DEATH.—ACCIDENTS DURING AND AFTER THE OPERATION.

In its original form Freund's operation was extremely bloody. Proper treatment of the base of the broad ligaments and the branches of the uterine artery was very difficult. Ligatures *en masse* were often insufficient. Even after proper ligature of the main branches of the uterine artery, hemorrhages which were checked with difficulty often occurred from the cut fornix and the valveless veins of the lax, peri-uterine cellular tissue. Many patients died as a direct result of the loss of blood, which was very apt to be dangerous to individuals who were usually in a very anæmic condition.

The difficult technique detailed long duration of the operation, during which the open peritoneal cavity was exposed to cooling and the displaced intestines were subjected to severe mechanical injuries. These factors, combined with the hemorrhage and protracted narcosis, were so much more apt to produce severe shock and fatal collapse, if textural anomalies of the heart muscle had developed as the result of protracted marasmus.

In three autopsies Binswanger observed marked fatty degeneration of the heart with negative appearances in the abdominal cavity.

The long duration of the operation and the often incomplete hæmostasis also favored, in a high degree, the occurrence of sepsis. This was also very apt to result from direct contact of the peritoneum with the degenerating tumor which was manipulated through the abdominal cavity and vagina during the last stage of the operation.

A further danger arose from injuries to the urinary organs and intestines. The ureters were particularly endangered. They were repeatedly included in the lower ligatures and not infrequently were cut through. A number of patients died of uræmia.

Recent improvements have diminished considerably the dangers of ventral extirpation. The preliminary separation of the uterus from the vagina secures better exposure of the field of operation, and, in conjunction with Freund's clamp forceps, permits a preparatory checking of the bleeding. Injuries to adjacent parts were obviated more readily and the duration of the operation was shortened. Drainage guards at least against certain forms of septic disease. Nevertheless the operation remains a grave one.

The much slighter danger of vaginal extirpation is explained by the much more certain hæmostasis, and by the avoidance of a large opening into the peritoneal cavity. This obviates refrigeration and mechanical injury to the intestines. The entrance of infectious germs is avoided more readily on account of the small size and favorable position of the peritoneal wound. The much milder character of the operation is shown by the general appearance and condition of the patient. They look like normal puerperal individuals, who have lost considerable blood; they do not present a collapsed appearance and the pulse improves rapidly (Schroeder).

The most frequent causes of death after vaginal extirpation are hemorrhage and sepsis. Death from hemorrhage may occur from slow bleeding during a protracted operation or from sudden hemorrhage from a large torn vessel, spermatic or uterine artery, or one from which the ligature has slipped. Some patients succumb to intercurrent affections, such as pulmonary embolism. In rare cases ileus develops from adhesion of the intestine to the wound in the floor of the pelvis and subsequent flexion at an acute angle. Incarceration of the intestine in the pelvic wound has not been observed. In one of his cases Fritsch partly attributed the impermeability of the intestine to the pressure of the tampon introduced within the vagina

A considerable percentage of the fatal cases is the result of poisoning with the disinfectants employed. Permanent irrigations with concentrated solutions of corrosive sublimate or carbolic acid appear to be particularly dangerous, since incalculable amounts of these remedies may be applied to the wound surfaces and peritoneum during a long operation. Dusting the abdominal cavity with these agents is to be decidedly deprecated. The use of iodoform also requires great caution, as it has proved fatal in several cases. We have also observed distinct symptoms of poisoning, although the amount of iodoform used in the vaginal dressing was not especially great.

Among other disagreeable accidents during and after the operation the principal ones are injuries to the urinary organs and intestines (rectum, sigmoid flexure). The bladder has been injured most frequently by tearing, cutting or the actual cautery. The opening must be closed forthwith with sutures during the operation; not infrequently the injury is only recognized later on account of the incontinence, and, unless spontaneous closure takes place, a regular fistula operation must be performed. An ureter is injured or ligated much less frequently than in the ventral method. Boeckel was compelled to perform nephrectomy a month after the operation on account of a fistula of the left ureter. The opening in the wall of the ureter had been produced by the pressure of a pair of forceps. The cancer relapsed seven months later. In Starck's case the right ureter had been cut and ligated; on the 3rd day, fever and pains in the right renal region. Escape of urine through the vagina. Extirpation of the right kidney on the 6th day. Recovery.

In some patients intestino-vaginal fistulæ developed a longer or shorter time after the operation although the intestines had not been injured. In Bardenheuer's case the drainage tube produced erosion of the intestine. In the cases, observed by Olshausen and others, in which the abdominal communications did not appear until the end of 12 to 18 months, they were undoubtedly attributable to the spread of the relapsing carcinoma to the intestines, which were adherent to the fornix vaginæ. A series of unfavorable results are owing to an improper selection of the cases. These include non-completion of the operation on account of firm adhesion of the uterus to the pelvis, or cancerous adhesions to the intestines and pelvic peritoneum; also rupture of the parametral tissues and peritoneal reduplication, which are infiltrated with cancer, and hemorrhage from retracted vessels which cannot be isolated.

INDICATIONS FOR TOTAL EXTIRPATION.

Malignant growths (cancer, sarcoma) constitute the main indication for total extirpation of the uterus. The chief requirements are that: 1st, the tumor cannot be removed by a less severe operation; 2nd, excision of apparently healthy tissue still appears possible.

1. Total extirpation is excluded in carcinoma of the portio vaginalis and the lower part of the cervical canal, which may be extirpated by partial or total excision of the cervix. Cases of cancer of the body of the uterus are often excluded when they do not extend down to the internal os, and therefore can be entirely removed by amputation of the body of the organ through the abdominal cavity. Although the latter plan has been successful in a series of cases, nevertheless we regard total extirpation of the uterus through the vagina as a less dangerous operation. In addition we cannot always foretell with certainty that, after laparotomy has been performed, a partial extirpation of the uterus will prove sufficient.

2. The second condition is fulfilled if the uterus appears perfectly movable and careful bimanual exploration discloses neither an infiltration of the broad and sacro-uterine ligaments, nor metastases in the pelvic glands. An unyielding condition of the uterus on traction depends either on an extension of the disease to the ligaments or on flat adhesions of the uterus in the vesico-uterine and recto-uterine fossæ. Both are equally unfavorable and may not alone render the operation impossible but also make it unusually dangerous. The ligatures find no sure hold in the brittle tissues, while the trickling of blood and wound secretion from the cancerous surfaces of adhesion, which have been laid bare, render thorough cleansing of the abdominal cavity impossible and thus favor the occurrence of sepsis.

A less extensive spread of the growth to the vaginal walls often permits excision in healthy tissues, if the ligaments are free. In one case Schroeder removed the entire upper third of the vagina with the uterus.

If we hold fast to these conditions, total extirpation will be indicated chiefly in the three following forms of malignant tumors:

1. Carcinoma and sarcoma starting from the body and fundus of the uterus.

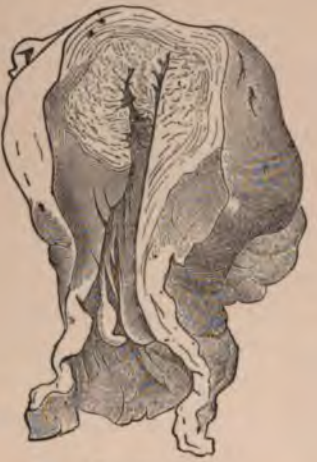

FIG. 134.

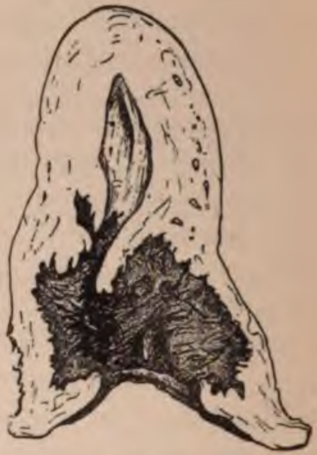

FIG. 135.

2. Glandular carcinoma starting upon the inner surface of the cervical canal, and extending to or beyond the level of the internal os.

3. Carcinoma starting from the deeper layers of the cervical wall, but which has not extended to the parametral tissues. Figs. 134, 135 and 136 furnish illustrations of these principal types, and give a clearer idea than detailed descriptions. Figs. 134 and 136 represent uteri which were extirpated by Kaltenbach. Fig. 135 is taken from Hofmeier's work.

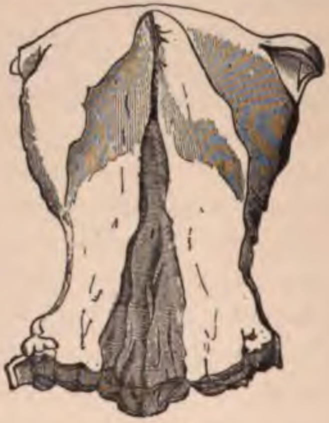

FIG. 136.

The conditions requisite for the radical treatment of uterine cancer by operation are rarely found. Schroeder attempted it in 19 per cent., Olshausen and Czerny in 27 per cent. of the cancer patients; Schroeder performed total extirpation in 5 per cent., Czerny in 15 per cent. and Olshausen in 19 per cent of the cases. Olshausen acknowledges that he has performed total extirpation too frequently, but believes that Schroeder was satisfied too often with partial extirpation.

The chances of radical cure are very slight in all cancer operations. In uterine cancer the conditions are especially unfavorable, because, as a rule, the disease is discovered later than in the external parts, and because the great abundance of lymphatics and blood-vessels favors the rapid extension of the disease to surrounding parts. Hence, better results should not be expected from the operative treatment of uterine cancer than from that of cancer in other parts, and it appears entirely unjustifiable to denounce total extirpation for the reason that it cannot certainly prevent relapses. Thus, the opposition to Freund's operation should not be based upon the frequent occurrence of relapses, but upon the ground that the palliative results are purchased at too great a risk to life. On the other hand vaginal extirpation does not offer any greater security than Freund's operation against relapses, and does not enable us to excise more of the surrounding healthy tissues. Indirectly a permanent effect may be expected more readily, because the much slighter danger to life encourages us to perform an early operation.

The recent progress in vaginal total extirpation has enabled us to reach almost the same standpoint in the operative treatment of uterine cancer as in that of cancer of other parts. In the hands of skilled operators and with a proper selection of cases the danger to life is hardly greater than in the extirpation of mammary cancer a few years ago,—an operation which is never dreaded, although radical cures are rare. Vaginal total extirpation is entirely justifiable on account of its palliative effects, apart from the possibility of a radical cure. The good effects obtained are very marked. Pain, hemorrhage and gangrene are relieved. Sleep, appetite and energy return for a time. The nutrition and strength are rapidly improved. If a relapse occurs the sufferings of the patient are less, as a rule, than if an operation had not been performed. [illegible] is generally not a local one in the cicatrix, [illegible] and appears along the pelvic lymphatics.

The prognosis in cancer of the body of the uterus is much more favorable than in cancer of the cervix. In the former the disease, which starts from the mucous membrane, will be discovered early on account of the hemorrhages, and will remain circumscribed for a longer time without extending entirely through the muscular coat. Radical recovery may also be expected more readily in sarcoma of the uterus than in cancer of the cervix.

An extension of the field of total extirpation cannot be looked for from further advances in the technique of operations, but may result from advances in diagnosis. Radical recoveries will not become more frequent, because we may be able to excise the tumor far to the outside, or because the kidney of the corresponding side is extirpated forthwith in disease of the uterus, but because physicians will learn, with the aid of diagnostic measures (curette, exploratory excision) to recognize the initial stages of malignant disease and thus to adopt early treatment.

Selection of the Operation.—When total extirpation appears indicated, the operation through the vagina almost always deserves the preference, but it will never be able to displace entirely the operation through the abdominal walls. In marked thickening of the uterus from pregnancy and imbedded myomata, and in large sarcomata of the body of the uterus, the ventral method is preferable, because it alone renders sufficient exposure of the field of operation possible. It is impossible to mention definite limits within which the enlarged uterus may be removed through the vagina. The selection of the method is also influenced by other factors, by the length and breadth of the vagina, the yielding character of the perineum, the amount of fat in the abdominal walls.

If the cancerous cervix in advanced pregnancy forms an absolute obstacle to delivery by direct obstruction or interference with dilatation, the only substitute for Cæsarean section or Porro's operation is the ventral method, in so far as it still appears possible to make the excision in healthy tissues. Freund's operation was performed under such circumstances by Bischoff and Spencer Wells, the latter operating successfully in the sixth month of pregnancy. In a case which was complicated with pregnancy Olshausen first produced artificial abortion and then extirpated through the vagina.

In some cases the necessity of substituting the ventral method for the attempted vaginal method is not recognized until the operation is begun.

In Fritsch's cases a large abscess, connected with the uterus, burst after the beginning of vaginal extirpation. Laparotomy was performed forthwith, in order to render possible the careful cleansing of the abdominal cavity. Subsequent opening of the abdominal cavity may also become necessary in extensive, non-cancerous adhesions of the uterus to the intestines or parietal peritoneum. In like manner, when there is uncontrollable hemorrhage from the torn spermatic or uterine arteries, which cannot be reached through the vagina, the exposure of the bleeding parts through the abdomen may be the sole means of saving the patient.

Incurable prolapse forms a second, but much disputed indication for total extirpation. The operation was performed in several old cases which were associated with malignant disease. In recent times, on the other hand, the operation has been performed a number of times on account of the prolapse alone. The operation seems to us to be justifiable if all other methods of treatment have proven useless, and if the persistent anomaly of position causes very notable symptoms or permanent incapacity for work. Diminution of the sexual functions need not be considered in such cases, as they occur almost exclusively in old women or in individuals in whom pregnancy is undesirable on account of the poor condition of nutrition. In prolapse the operation, on account of the convenient exposure of the site of operation, is almost entirely devoid of danger and promises certain recovery, in connection with subsequent kolpoperineorrhaphy.

These obstinate prolapses are seen particularly in marked elongation of the uterus, and in those cases in which the weight of the uterus is increased considerably by hyperplasia or imbedded myomata. The removal of the organ may also be desirable on account of chronic inflammatory processes of the endometrium, acute-angled flexions which are fixed in the prolapse, etc.

Two of Kaltenbach's operations were performed upon women at the menopause. In the first case high excision of the cervix was alone intended, but total extirpation was adopted because the posterior peritoneal fossa was unintentionally opened widely. In the second case all the operations ordinarily employed in prolapse had been unsuccessful. Pessaries could not be tolerated and the elongated uterus descended constantly despite the great narrowing of the vagina. The patient, who was on the point of emigrating to America, insisted upon permanent relief of the malady. Both patients were cured.

Werth performed total extirpation in a case of inversion of the uterus. During the excision of the uterus, which was drawn in front of the vulva, the posterior uterine wall was perforated, and Werth believed that the dangerous hemorrhage into the abdominal cavity could only be checked by ligature of the supplying vessels after total extirpation.

For the sake of completeness we will mention finally that total extirpation has been performed repeatedly in fibro-myoma of the uterus, at times intentionally, at times because it was mistaken for a malignant tumor. Total extirpation in simple adenoma of the body of the uterus or in otherwise uncontrollable hemorrhages at the menopause, we regard as unjustifiable or insufficiently indicated at the present time.

EXTIRPATION OF FIBROID TUMORS OF THE UTERUS THROUGH THE ABDOMEN. — MYOMOTOMY. — PARTIAL EXTIRPATION OF THE UTERUS THROUGH THE ABDOMINAL WALLS.—SUPRA-VAGINAL AMPUTATION OF THE UTERUS.

History of these Operations.

In the following section we will consider all those operations which have been performed for the removal of fibro-myomata of the uterus through the abdomen,—myomotomies in the broad sense. They include the removal of pedunculated, subserous myomata, the enucleation of fibromata from the uterine walls and broad ligaments, and the partial removal of a larger or smaller part of the uterus together with the imbedded or adherent tumor. The latter operation, supra-vaginal amputation of the uterus, is also to be considered in the removal of malignant tumors of the body of the uterus, and finally on account of a few other rarer indications.

At first laparotomy in fibrous tumors of the uterus was almost always performed on account of errors of diagnosis. The tumor had been regarded as ovarian, or, in doubtful cases, an exploratory incision alone had been intended. As soon as the real condition of affairs was ascertained further attempts at operation were abandoned, on account of the startling development of the vessels. Of fourteen cases of this kind five terminated fatally as the result of the exploration. The removal of pedunculated fibromata of the uterus was the first operation of the kind attempted. Granville's operation (1837) terminated fatally, but Atlee and Lane (1844) successfully extirpated subserous polypi. In 1843 Clay and Heath undertook the first partial amputations of the uterus on account of broad-based, subserous or interstitial tumors. Both patients died of hemorrhage a few hours after the operation. The first successful operations of this kind were performed by Burnham and Kimball (1853). In 1864 Koeberlé collected 50 cases of gastrotomy in uterine tumors. Only 35 operations (12 recoveries, 23 deaths) were complete. The 12 recoveries included 7 extirpations of pedunculated tumors and 5 supra-vaginal amputations of the uterus with or without removal of the ovaries. Kimball and Koeberlé alone performed the operation on the basis of an accurate diagnosis and according to a well-devised plan. Later successful operations were reported by Stilling, Spencer Wells, etc.

To Péan belongs the credit of placing the operation on a scientific foundation. He first described a precise method of operation, and operated only in diagnosed cases and on account of definite indications. In 1873, Péan had reported nine laparotomies for fibroid tumors of the uterus, with seven recoveries.

These favorable results led to the rapid adoption of the operation.

In 1878 Gusserow collated 17 cases of extirpation of pedunculated myomata with 12 deaths (70.5 per cent), 55 supra-vaginal amputations with 32 deaths (58 per cent.), and 41 extirpations of fibro-cystic tumors with 19 deaths (46.3 per cent.). Bigelow's statistics extend to the middle of 1883 and include 573 operations for myoma with 311 recoveries. Of these operations 247 were treated extra-peritoneal (143 recoveries), 84 intra-peritoneal (50 recoveries.)

The following table includes the latest known series of operations of surgeons who have had large experience, and, as a general thing, have operated according to known methods.

	Period.	Number of Operations.	Recoveries.	Deaths.
Péan . .	until July, 1881	51	33	18
Spencer Wells .	beginning of 1882	40	19	21
Thornton .	1882	25	16	9
Bantock . .	Aug., 1882	21	15	6
Lawson Tait .	Sept., 1882	30	20	10
Billroth . .	1882	25	10	15
Savage . .	1882	9	6	3
Thomas . .	1882	13	7	6

	Period.	Number of Operations.	Recoveries.	Deaths.
Kimball	Oct., 1883	11	6	5
Keith	Dec., 1883	25	23	2
Kuester	1883	16	9	7
Howitz	1883	8	6	2
Koeberlé	Aug., 1884	about 50	?	?
Schroeder	1884	100	68	32
Olshausen	1884	29	20	9
Martin	1885	65	42	23
Hegar	beginning of 1885	31	21	10
Kaltenbach	1885	18	15	3

Péan's method of extra-peritoneal fixation of the uterine stump with wire sutures did not give such favorable results in the hands of other operators, and was soon modified in various ways.

A decided advance was made by Kleeberg's constriction of the uterine stump with elastic ligatures. After 1879 Hegar first employed them in perfecting the extra-peritoneal method. Péan's wire loops were replaced by elastic ligatures, which remained permanently *in situ* and were absolutely certain to check hemorrhage. Hegar further secured closure of the abdominal cavity by stitching the peritoneum around the stump, the latter being made aseptic by the actual cautery and the application of chloride of zinc. The results obtained by this plan surpassed all previous results, and it seemed as if the extra-peritoneal method would secure the upper hand. In the meantime, however, the brilliant results of intra-peritoneal treatment of the pedicle in ovariotomy caused its employment in myomotomy. Here, also, elastic constriction formed the starting-point for the development of successful methods of operation.

ANATOMY OF SUBSEROUS AND INTERSTITIAL FIBRO-MYOMATA OF THE UTERUS.

Subserous and interstitial fibro-myomata of the uterus are almost the only ones which need be considered with reference to laparotomy.

Subserous myomata often appear multiple, as external or peritoneal polypi. They are apt to give rise, on account of the mechanical irritation of the peritoneum, to very large ascitic transudations, within which they float (ballotement) like the fœtus in the amniotic fluid.

Single subserous myomata usually start from the fundus and posterior wall of the uterus, especially from the pars keratina (Fig. 137, after Koeberlé). They are pedunculated, or, at least, have a constricted base like a pedicle. Their insertion extends occasionally over large areas of the fundus and corpus uteri or even to the linea terminalis.

The large majority of interstitial myomata start from the corpus and fundus uteri, leaving the cervix free over a larger or smaller area, or even elongating it. Small tumors are situated exceptionally in the cervix or the latter appears effaced, because it takes part in a diffuse manner in the "fibroid degeneration" of the uterus, or its walls have been used in enveloping a portion of the corporeal tumor which is growing downwards.

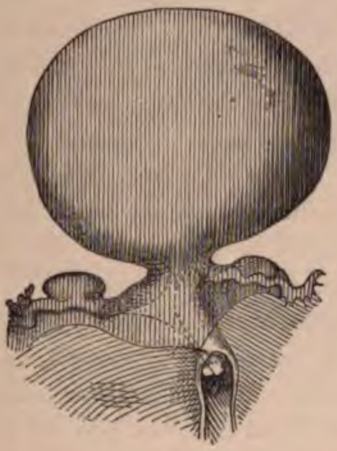

FIG. 137.

In extremely rare cases the cervix itself forms the starting-point of large interstitial tumors. One lip of the os then appears converted into a spherical tumor to which the other lip is applied as a sharp border. The os is drawn into a slit or elongated. As the cavities are elongated, the upper parts of the uterus are displaced upwards. The intact remainder of the corpus and fundus is situated as a button-shaped protuberance upon the tumor (Fig. 137).

The shape and character of the surface of the tumor depend upon the condition of the outer layers of the muscular coat of the uterus. If there is a continuous mantle of intact uterine substance, the tumor presents a smooth surface and a spherical or elongated oval shape. But if the uterine wall is perforated in various places by fibroma nodules, or subserous and interstitial or even sub-mucous myomata also develop, nodular tumors are formed or even irregular tumor-conglomerates.

When the tumors start from the fundus or one horn of the uterus, the ovaries retain approximately their normal position, about at the level of the entrance to the pelvis.

In interstitial myomata of the cervix and body they rise with the other appendages, as in pregnancy, so that they may be felt not infrequently through the abdominal walls, situated symmetrically on the sides.

In large uterine fibromata the ovaries are often cystic or very hypertrophic; the tubes are distended occasionally into large sacs by the retention of secretion. The urinary organs not infrequently present important sequelæ, such as dilatation of the ureters and renal pelvis with secondary changes in the parenchyma of the kidneys.

The tumors which start from the upper portions of the uterus generally rise out of the broad ligament in such a manner that the cervix forms a pedicle for the tumor. On the otner hand those tumors which start from the lower part of the fundus separate the broad ligaments so much the more, the more they extend to the cervix. The lateral border of the tumor may then approach the wall of the pelvis.

Intra-ligamentary uterine fibromata present very peculiar appearances. The uterus is pushed to one side or downwards, but more frequently it is raised out of the pelvis. While the tumor constantly grows further between the folds of the broad ligament into the pelvic cellular tissue, the uterus rises higher on the other side, or, after being considerably elongated, stretches across the tumor like an arch. The portio vaginalis can no longer be felt, the slit-shaped os alone being palpable. After the enucleation of the tumor, however, a long narrow cervix may become apparent. The site of reduplication of the peritoneum in the vesico-uterine fossa moves upward with the uterus. At the same time the bladder is elongated, so that its base may extend to the level of the umbilicus.

The tumor sometimes unfolds only one ligament and drags the uterine appendages on that side far upwards, while those of the other side remain in the normal position. The relations may become very difficult of solution on account of co-existing torsion of the body of the uterus on its long axis. The origin of the round ligaments forms a good starting-point for determining the position of the body of the uterus. The posterior reduplication of the peritoneum not infrequently ascends very far, indeed *the* tumor may continue to grow altogether in the retro-peritoneal cellular tissue.

The intra-ligamentary tumors are sometimes multiple or occur as nodular, lobulated tumors. They are either situated entirely free in the pelvic cellular tissue, and are capable of enucleation, or they are connected with the uterus by a sort of pedicle. In accordance with their genesis, they are sometimes partly covered, apart from the peritoneum, with thin distended layers of uterine muscular tissue.

Large fibro-myomata, especially subserous ones, often contain accumulations of fluid, cystic formations (fibro-cystic tumors). This may result from simple œdematous swelling; from dilatation of the lymph spaces (fibro-myoma lymph-angiectodes), the fissures which are filled with fluid gradually coalescing into large dissecting cavities, lined occasionally with endothelium; finally from foci of degeneration within the tumor. In the latter event the cavities contain cellular elements and detritus of various kinds, in addition to degenerated muscular fibres, blood, and clumps of fibrin. It is these very fibro-cystic tumors which attain a colossal size. Schuh found 40 quarts of a brown fluid in a tumor of this kind. Spencer Wells extirpated a pedunculated tumor (situated on the fundus uteri) whose solid part weighed over sixteen pounds and which contained, in addition, twenty-six pints of fluid fibrin and four pounds of clumps of fibrin.

Péan and Urdy,[1] Demarcquay, Lebec[2] and others describe independent cysts of the uterus without co-existing development of fibromata. These are said to be situated between the peritoneum and uterus (subperitoneal cysts) or in the tissue of the uterus. The accurate anatomical character of four cases, upon which Péan[3] operated, is determined with difficulty from the statements furnished. In one case, in a woman *aet.* 53 years, the tumor seems to have been a sarcoma with hydrometra; in the three other cases the contents (7-10 litres) were hemorrhagic or composed of a mixture of pus and blood.

Simple œdematous softening is allied to the occasional conversion into myxoma. Transformations into sarcoma have also been described. In the case illustrated in Fig 138 (after Spencer Wells) it is said that a fibrous tumor had been extirpated from the jaw eleven years before.

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[1] Péan and Urdy state: "La poche du kyste est formée dans ce cas par le tissu utérin lui-meme, soit qu'il ait conservé ses caracteres normaux, soit qu'il ait subi la dégénérescence graisseuse ou granuleuse."

[2] Etude sur les tumeurs fibrokystiques et kystes de l'utérus, Paris, Delahaye.

[3] Clinique chirurg., 1876, p. 680; and 1879, p. 812 and 813.

Adhesions to adjacent organs are much rarer in uterine fibromata than in ovarian tumors. They are seen most frequently on the anterior abdominal walls after previous punctures or exploratory incisions. In addition to loose, cobweb-like adhesions we may find very firm and extensive adhesions, characterized by an abundance of veins. In other cases we find circumscribed, vascular bands or even isolated vessels which pass to the abdominal walls, omentum and intestines, and furnish the tumor with an abundant supply of nutritive material. Not infrequently the rapid growth of the tumor may be ascribed clinically to a circumscribed peritonitis; Kœberlé observed three arteries as thick as the radial, pass from the omentum into the tumor.

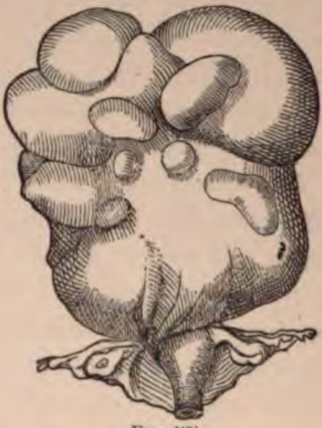

FIG. 138.

The vessels of pedunculated tumors are usually insignificant. Those which have a broad origin from a horn of the uterus receive a plentiful supply of blood from the inosculating terminal branches of the internal spermatic and uterine arteries. This explains the fact that tumors in this position grow so rapidly and are so often the subject of operative interference. The more such a tumor, after partly unfolding the ligament, passes to the side, the more directly do the main trunks of the uterine and spermatic arteries enter the base of the tumor. Interstitial fibromyomata present a rich development of vessels. The greatly dilated spermatic and uterine arteries give off large branches, and, in their ascent along the lateral border of the tumor, present an arrangement similar to that in the pregnant uterus. Near the entrance to the pelvis the bundles of spermatic and uterine vessels separate more and more. The former pass laterally or more posteriorly from the rim of the pelvis, along the infundibulo-pelvic ligaments, to the tubes and ovaries. The uterine artery and its branches run along the lateral border of the cervix. Broad sections of the ligaments between the two vascular tracts are often transparent and free from vessels.

The separation of both vascular tracts is very pronounced in intra-ligamentary tumors. Upon the topographical condition depends the possibility of enucleating an intra-ligamentary tumor from the pelvic cellular tissue, with blunt instruments and without any marked hemorrhage, after ligation of the spermatic bundle of vessels, since larger vessels only appear again at the cervix, as it is gradually rendered free.

It must also be mentioned that vessels of no inconsiderable size enter and emerge from the tumor along the round ligaments.

INDICATIONS FOR MYOMOTOMY AND SUPRA-VAGINAL AMPUTATION OF THE UTERUS.

Fibromyomata of the uterus *per se* are benign tumors. They often produce very slight symptoms, grow slowly, and usually remain stationary or undergo retrogressive metamorphosis at the menopause. Their extirpation through the abdominal walls therefore comes into question only under exceptional circumstances, when the symptoms are very severe or there is danger to life, and not until medicinal measures or milder operations have proven useless or promise no success from the start. The following special indications, under these restrictions, may be mentioned:

1. Rapid growth and hence severe compression-symptoms on the part of the abdominal and thoracic organs. These attain an intolerable severity much more rapidly on account of the firm, unyielding character and great weight of fibrous tumors than in equally large cystic tumors. Thromboses within the tumor itself or in the adjacent veins of the pelvis and thighs form a hitherto insufficiently regarded source of great dangers.

The menopause does not, by any means, check the growth of the tumors in all cases. The tumors sometimes attain a colossal size very rapidly at this period, because they undergo fibro-cystic or other degeneration, or are nourished by newly developed, vascular adhesions. But the symptoms are by no means directly proportionate to the size of the tumors. Even small and medium-sized tumors may become so annoying on account of the pains, peritonitic irritation, impaired motion and inability to work, that their removal becomes a vital question to the patients.[1]

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[1] Some authors attribute severe nervous disturbances and cerebral symptoms

2. Severe hemorrhages, uncontrollable in other ways, in interstitial or sub-serous tumors, provided that their removal through the natural passages is not practicable or appears too dangerous, and castration does not promise success.

3. Marked ascites produced by sub-serous myomata. As a matter of course this can only be relieved by the removal of the irritative cause

4. Unfavorable changes in the tumor itself and its surroundings. These include the development of cysts, myxomatous or sarcomatous degeneration, suppuration, gangrene, puerperal degeneration, torsion of the pedicle with all its consequences, finally peritonitic processes.

5. Symptoms of incarceration of the pelvic organs from impaction of sub-serous or intra-ligamentary tumors, which can not be relieved by other means.

6. Complete, irreducible prolapse of the uterus, resulting from large fibromyomata, which are inserted in the fundus or corpus uteri. The symptoms may become intolerable, while the removal of the tumor alone promises success, particularly if the stump is fastened extra-peritoneal. Kaltenbach, Müeller, and Schroeder have operated successfully on account of this indication.

A grave significance attaches to the complication of large uterine fibromata with pregnancy. This accelerates the growth of the tumor and increases the compression of the abdominal and thoracic viscera to the point of danger. Moreover the displacement of pedunculated tumors may give rise to torsion of the pedicle, and may lead to peritonitis with or without the latter complication. Cappie[1] reports a case in which death, with the symptoms of acute peritonitis, occurred in the fourth month of pregnancy, after torsion of the pedicle of a fibroma.

Such sequelæ may compel us to interfere on account of a vital indication, and, on account of the impossibility of diminishing the size of the tumor, we are reduced to the alternative of producing premature delivery or extirpating the tumor. But premature delivery is open to the most serious objections. It is attended with disproportionately great danger,

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(paraplegia, ataxia, hyperæsthesia, psychical disturbances, especially melancholia, etc.), to the circulatory disturbances, etc., produced by large uterine fibromata. Péan reports several cases in which such symptoms disappeared after the operation, and we have seen similar cases. Mays even mentions a case in which epileptiform attacks ceased after the operation.

[1] Edin. Med. Journ., xx., p. 10.

and, even in the most favorable event, relieves the compressed organs very little. Hardly any time is gained and the patient is twice subjected to unnecessary danger, because the subsequent extirpation of the tumor becomes unavoidable. The dangers of the artificial interruption of pregnancy consist chiefly of profuse hemorrhages, particularly when the placenta is inserted upon the non-retractile tumor, and of the possibility of puerperal degeneration of the tumor.

For these reasons extirpation of the tumor is decidedly preferable. But isolated extirpation is practicable in pedunculated tumors alone, while in broad-based subserous or interstitial tumors the extirpation of the tumor and the pregnant uterus is the only measure left open to us. When the symptoms threaten life there can be no doubt of the propriety of this operation, which relieves the dangers due to the tumor and the pregnancy, and is therefore more effective than simple abortion, which is also dangerous. The extirpation of the tumor and pregnant uterus is also indicated for technical reasons, because the puerperal processes constitute very favorable conditions for supravaginal amputation of the uterus, on account of the increased yielding character of the cervix and ligaments. We will here give the results, in brief, of the myomotomies and supravaginal amputations performed hitherto, when complicated with pregnancy.

I. *Simple Myomotomy with Retention of the Uterus.*

Author.	Date of Operation.	Period of Pregnancy.	Anatomical character of the tumor, and indications.	Result.
Péan,	Dec. 15th, 1874,	5th month,	Fibrocystic, colossal tumor.	Recovery; abortion on day after operation.
Thornton,	Obst. Soc., June 4th, 1879,	7th month,	Pedunculated tumor.	Death on 7th day.
Schroeder,	Nov. 16th, 1879,	4th month,	Several pedunculated myomata.	Recovery; delivery at full term.
Hegar,	January, 1880,	3d month,	Softened, pedunculated myoma; peritonitis.	Death on 3d day.
Studsgard,	Dec. 19th, 1882,	3½ months,	Pedunculated tumor.	Recovery; pregnancy undisturbed.
Martin,	Berl. klin. Wschr. 1885, 3,	6th month,	Myomotomy with wedge-shaped excision of fundus.	Death on 7th day from hemorrhage after abortion.
Landau,	Berl. klin. Wschr. 1885, 13,		Myoma of right side as large as child's head; on left side large as hen's egg.	Recovery; delivery at full term.

II. *Supravaginal Amputation of the Pregnant Uterus.*

Author.	Date of Operation.	Period of Pregnancy.	Anatomical character of the tumor, and indications.	Result.
Kaltenbach	Mar. 2nd, 1880,	5th month,	Interstitial myoma of fundus, weight 3500 gms.	Recovery
Wasseygr,	Mar. 18th, 1880,	5th month,	Interstitial myoma of fundus, weight 4500 gms.	Death on 6th day.
Nieberding,	Feb. 10th, 1882,	4th month,		Death in 49 hours.
Schroeder,	Jan. 10th, 1883,	3d month,		Recovery.
Schroeder,	June 21st, 1884,	3d month,	Intramural tumor, as large as a man's head.	Recovery.
Walter,	Brit. Med. Assn. Liverpool, 1883,	4th month,	Colossal tumor.	Death on 9th day.

On account of the histological character of uterine fibromata the indications for myomotomy cannot be so sharply defined as in ovariotomy, and depend upon the individual peculiarities of the case.

The increasingly better results of myomotomy will probably be due to early operation, if the indication is present. If the general condition has been decidedly impaired by hemorrhages and digestive disturbances, if symptoms of irritation and compression of the abdominal organs have appeared, and the tumor, particularly in young persons, has grown steadily until it weighs a number of pounds, nothing can be gained by waiting until it fills the entire abdominal cavity or until its individual effects prove immediately dangerous to life. In the interests of the patient the operation, which will become imperative after a longer or shorter interval, should be performed early, while the vital energies are still retained.

Interstitial myomata of the cervix and intra-ligamentary tumors require very careful weighing of the indications. It is true that our operative resources in these unfavorable conditions have been improved very notably, but the danger of operation is still much greater than in other cases. Even at the present time certain tumors must be regarded as incapable of operation, for example, the so-called fibrous degenerations of the uterus, in which poorly circumscribed myomata of the body of the uterus extend to the cervix and even protrude in large masses through the open cervical canal into the vagina. In such cases the adhesions to surrounding parts in the pelvic and abdominal cavities are so firm at times that even the knife of the anatomist finds its way with difficulty through the thick inflammatory callosities.

Among the temporary contra-indications of myomotomy we would lay special stress on an excessive degree of anæmia, and upon recent, non-consolidated thrombi of the veins of the pelvis and thighs.

A number of operators have performed supravaginal amputation of the uterus in sarcoma and carcinoma of the body of the organ, which left the cervix intact. The results of these operations appear to have been quite favorable both as regards life and the occurrence of relapses. Nevertheless we would perform partial removal of the uterus through the abdominal walls only when the organ is markedly thickened and the vagina very narrow. In all other cases total extirpation through the vagina is to be preferred as a less dangerous operation, especially as we are unable to foretell with certainty in all cases whether partial amputation of the uterus, after opening the abdominal cavity, will suffice.

Mueller recently performed supravaginal amputation successfully in three cases as a curative method in severe prolapse (without the development of fibroma). The genitalia were to be retained in position by the healing of the cervical stump in the abdominal wound. This operation seems to us to be even more dangerous than total extirpation of the prolapsed uterus through the vagina, and, at the same time, does not promise such positive results, inasmuch as the cicatrix of the stump may subsequently undergo considerable prolongation.

TECHNIQUE OF THE OPERATION.

Diminution in Size, and Withdrawal of the Tumor.

The first stage of the operation is identical in all forms of myomotomy.

The preliminary treatment, position of the patient, and distribution of the assistants are the same as in ovariotomy. Disinfection of the vagina and, so far as possible, of the uterus is very important.

In the interests of a rapid and clean operation a free incision is to be preferred to complicated and, at the same time, rarely sufficient attempts at diminution of the size of the tumor. Diminution by puncture is only possible in fibrocystic tumors, which contain large cavities. In rare cases only will much be attained in this way. Even when fluctuation is apparently very distinct, very little fluid escapes because the dissecting cavities within the tumor do not communicate freely with one another or because the contents of large foci of degeneration are formed, in part, by thick clumps of fibrin. On the other hand a large incision into the tumor may give rise to severe hemorrhage or to the entrance of the contents of the tumor into the abdominal cavity. It is therefore best to restrict puncture to cystic tumors of excessive size, whose removal must be facilitated by every means possible.

Kimball, Péan, and Billroth occasionally have produced sufficient diminution by separate enucleation of the individual fibroma nodules. But this plan is apt to give rise to considerable hemorrhages which may gradually be aggregated to a dangerous height, even if the tumors are firm and poor in vessels.

Péan diminished large tumors by so-called "morcellement." The tumor is drawn as far as possible into the abdominal wound by means of a strong pair of forceps, provided on its inner surface with long serrations (Fig. 139). A stout loop of wire is drawn through the projecting part of the tumor by means of a curved needle (Fig. 140). Both halves of the wire are grasped in Cintral's serre-noeud (Fig. 141) and twisted together towards the sides.[1] A wedge-shaped piece of the anæmic tissue is then excised between the wire twisters. A similar plan is adopted with other projecting parts of the tumor, until finally the loops were nearly equatorially over the greatest circumference of the tumor, and the latter may be diminished sufficiently to pass through the abdominal wound. This plan is extremely complicated, it requires several hours, and, moreover, is liable to be interrupted by disagreeable accidents. The tearing through or slipping of the wire loops has been followed repeatedly by very considerable hemorrhage. In addition the supply of blood to the constricted parts has not always been cut off entirely.

In solid tumors we relinquish all attempts to diminish the size of the tumor, expose it by a correspondingly long incision, and attempt to push it out of the abdominal cavity *in toto*, partly by pressure from behind, partly by pushing back the edges of the wound. The use of forceps in drawing the tumor forwards is to be deprecated, because it is apt to tear through and render the operation unclean The protrusion of the tumor is facilitated very considerably if it is grasped with a dry towel and a narrow lateral rim is first pushed out of the wound. Certain prominent nodules may sometimes be used as convenient handles for withdrawal of the tumor. Smaller growths may be pushed out of the pelvis through the vagina by the aid of an assistant, in order to secure more favorable, deeper points of rotation at the upper edge of the symphysis.

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[1] This instrument combines the properties of ecraseur and wire twister, *i. e.*, turning the screw at the handle simply diminishes the size of the loop (ecraseur action) if the middle portion is fixed, but twists the wire if the head-piece is fixed.

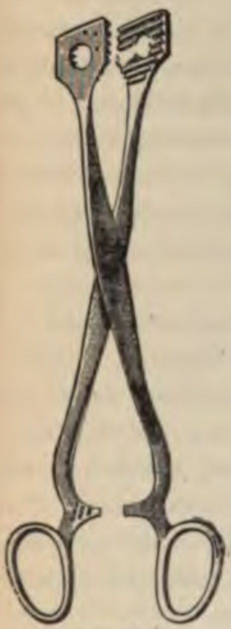

FIG. 139.

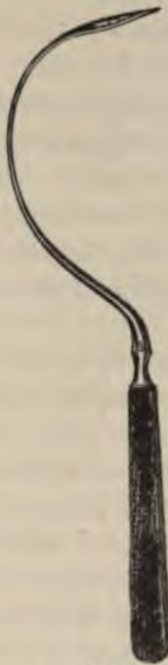

FIG. 140.

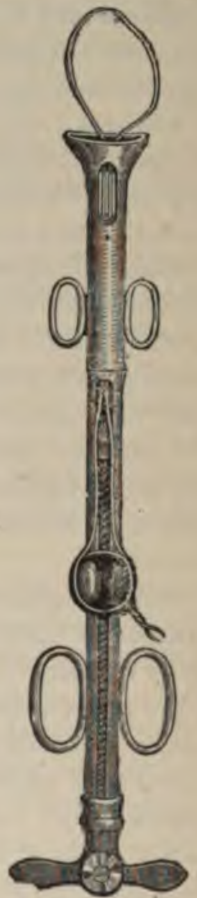

FIG. 141.

The removal of the tumor is obstructed much less frequently than in ovariotomy by the presence of adhesions. Very great difficulties may arise from firm and extensive adhesions to the anterior abdominal wall. These are characterized by marked vascularity, especially after preliminary exploratory incisions. The hemorrhage from the colossal dilated veins of the adhesions and capsule of the tumor can only be controlled with certainty by constrictions of the nutrient vessels at the base of the tumor.

We should, therefore, not delay long with fruitless attempts at ligating the vessels directly, but should compress them provisionally, prolong the incision beyond the boundaries of the adhesions, and endeavor to liberate the tumor as rapidly as possible, the adhesions being cut through between ligatures *en masse*.

Adherent omental bands are not separated at the tumor, but are cut at some distance from it between double ligatures. The ligation on the side next to the tumor is absolutely necessary on account of the large calibre of the communicating vessels.

Intestinal adhesions are treated as in ovariotomy. In a case of very extensive and firm adhesion to the colon, Schroeder made an incision around the entire adherent surface at a distance of ½ to 1 cm. from its edges, and separated it from the tumor together with the peritoneal lining of the latter, by means of blunt instruments. The broad bleeding surface on the intestine was then stitched over with the free edges of the peritoneum; the hemorrhage was thus checked completely and the entire wound surface of the intestine was covered with peritoneum without constriction of its lumen.

After the tumor has been protruded from the abdominal cavity, a few sponges are placed in Douglas's sac and behind the abdominal wound in order to absorb blood and ascitic fluid. An assistant then pushes the edges of the abdominal wound firmly behind the tumor, and thus shuts off the peritoneal cavity. If the incision is very long, it may be partly closed at its upper angle immediately after removal of the tumor. The assistant must hold the tumor carefully and quietly over the abdominal wound, in order that dangerous rents in the tense edges of the ligaments may not result from lateral traction.[1]

The subsequent course of the operation is entirely different according to the mode of insertion of the tumor. We will discuss in three sections:

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[1] It has been suggested that a portion of the blood in the tumor should be preserved for anæmic patients, by compressing the tumor or enveloping it in an Esmarch bandage. Such a plan, however, which was attempted by Labbé in one case, is attended with incalculable dangers on account of the frequency of extensive thromboses within the tumor.

1. The removal of pedunculated myomata without opening the uterine cavity (myomotomy in the strict sense).

2. Supra-vaginal amputation of the uterus, *i. e.* partial removal of the uterus with the tumor.

3. The enucleation of intra-mural and intra-ligamentary myomata, with or without removal of the uterus.

REMOVAL OF PEDUNCULATED MYOMATA.

Pedunculated tumors, and those which start from the uterine tissue with a pedicle-like base, may be removed, although the uterus remains intact, or at least its cavity is not opened.

Intra-peritoneal treatment of the base of the tumor is always possible in such cases. Pedicles up to the thickness of the thumb are perforated like ovarian pedicles, tied with a double silk ligature and are then cut, leaving a sufficiently long stump. Elastic ligatures may also be used to advantage. Simple separation of the pedicle with the actual cautery or *écraseur,* and its ligature *in toto,* do not guard sufficiently against hemorrhage, at least when silk ligatures are employed. Sub-serous polypi with narrow pedicles may be cut off with the scissors and the edges of the peritoneum sewed together over the small wound.

The treatment of the surface of implantation requires great caution when the tumors start from the fundus uteri with a broad base. We then use elastic partial ligatures, or temporarily constrict the insertion of the tumor with a rubber tube, excise the tumor in a wedge-shape and sew up the funnel-shaped wound. But as sutures, which do not encircle transversely the vessels emptying into the wound surface, are insufficient for complete hæmostasis, we are generally compelled to ligate separately the vessels visible in the wound or to ligate the tissues. Hofmeier also calls attention to the unusual difficulty of completely checking, by sutures, the hemorrhage from the surface of amputation in the uterus, and recommends that a few sutures be applied obliquely to the line of the wound, and that they be tied very firmly.

Some physicians prefer extra-peritoneal treatment of the pedicle with clamps, serre-nœuds, etc., even in pedunculated tumors. Péan even adopted this method in a case in which the pedicle was as thick as the thumb and 5 cm. long. In another case he enucleated the tumor (at the fundus) from its capsule and converted the latter into a pedicle, which he fastened in the lower angle of the wound.

Supra-vaginal Amputation of the Uterus.

Sub-serous tumors with a very broad base can only be extirpated, like the majority of interstitial myomata, in connection with a larger or smaller segment of the uterus, whose cavity is opened in almost every case.

The height of the plane of removal depends partly on the mode of development of the tumor, partly on technical considerations. In sub-serous myomata of the fundus it may be situated above the uterine appendages. In interstitial myomata of the body it is situated generally at the level of the cervix, a place which is preferred for technical reasons, on account of the convenience of treatment.

The principle must be borne in mind that, if the woman have not reached the menopause, the ovaries must also be removed if even a part of the uterus is extirpated. This is owing to the possibility of subsequent conception or of serious disturbances of menstruation. Even a uterine pregnancy would entail considerable danger if a portion of the fundus were absent. But if the uterine cavity has been opened during the operation an abdominal pregnancy may result (as was observed by Kœberlé), when the cervical canal communicates with the abdominal cavity after intra-peritoneal treatment. Kœberlé and Péan observed catamenial hæmatoceles, which were owing to the retained ovary. In Péan's case the hemorrhage was fatal. In the only case (a patient *aet.* forty-five years) in which Kaltenbach allowed the ovaries to remain for technical reasons, extremely violent pains set in at each menstrual period and did not cease until the menopause, one and a half year later.

Despite the recently advanced theoretical opposition, we consider the removal of the ovaries necessary, unless this is associated with disproportionately great danger on account of their unfavorable insertion or difficulty of access. Less importance attaches to the annoying menstruation through a utero-abdominal fistula, after extra-peritoneal treatment.

The stumps of the uterus may be treated by the extra-peritoneal or intra-peritoneal method.

A. EXTRA-PERITONEAL METHOD.

Spencer Wells appears to have made the first attempt to procure extra-peritoneal fixation of the uterine wound surface. After removal with the *écraseur* of a tumor which was inserted by a broad base into the fundus, a severe hemorrhage set in and could not be checked by the ligature or actual cautery. Wells then passed two large needles through the uterus, encircled them in ligatures of figures of 8, and then fastened the parts in the lower angle of the wound.

But Péan was the first to develop methodically the extra-peritoneal treatment of the uterine stump He passes two straight steel needles, crossing one another, obliquely through the cervix, and beneath them draws a firm wire loop through the cervix in a sagittal direction. After the two halves of the loop are separated they are tied by means of two Cintrat's serre-nœuds, and the uterus is then excised at some distance from the needles, a short stump being retained. If blood continues to trickle the wires are twisted still more with the serre-nœuds. The stump is secured extra-peritoneal by means of the needles, the wire loop, and the serre-nœuds which are left in position. In a few cases Péan modifies this plan. If the stump is thick, he ligates it in three divisions, or only treats the central portion with wire twisters, and merely applies his *pinces hémostatiques* to the retracted capsule of the tumor

Péan's method is attended with various disadvantages. The wire is apt to cut through if the ligaments are very tense or if it is firmly twisted, and fatal hemorrhages have been produced repeatedly in this manner. Furthermore the constriction of the stump is not uniform and permanent. The broad ligaments and spermatic vessels are especially apt to slip out of the lateral angles of the wire loops. If the stump diminishes rapidly in size, the rigid wire loops become insufficient; blood again begins to exude, and we are compelled to tie more firmly, thus dragging in a dangerous manner upon the fresh adhesions near the stump. Finally the abdominal cavity cannot be closed thoroughly in Péan's operation, and sufficient precautions against decomposition of the stump are not adopted. The use of clamps, or of *écraseurs* with rounded links, obviates only some of the disadvantages of the wire loop. These instruments also cover the vicinity of the stump, and thus increase the difficulty of keeping it aseptic.

Hegar's extra-peritoneal method offers a thorough remedy against the disadvantages of Péan's operation. After carefully determining the boundaries of the bladder, the degree of tension of the ligaments, the condition of the ovaries and the connections of the tumor, the cervix is encircled by an elastic ligature. We employ double tubes,of a diameter of 0.5 to 0.6, which are inserted concentrically in one another, and can be thinned almost one half by traction. If the bladder is drawn upwards by the tumor, it must first be separated from the uterus by blunt instruments, after transverse incision of its serous lining. The elastic ligature of the cervix prevents any further supply of blood to the tumor, and the latter may then be excised 4 to 5 cm. above the ligature. Dark blood, whose amount is terrifying to the tyro, gushes from the tumor during excision. This must be absorbed with sponges, and kept out of the peritoneal cavity, by carefully keeping the edges of the abdominal walls in apposition. On the other hand, we have never observed any hemorrhage from the ligated stump.

If the circumference of the part which is to be constricted is very considerable, or the ligaments are very tense, the elastic ligature *en masse* may be replaced by two partial ligatures of somewhat less calibre. Kleeberg introduces them through the canula of a large trocar. But the large opening of perforation is apt to tear, and hemorrhages then occur from the rent which is situated on the central aspect of the ligatures. We formerly employed, for the insertion of the ligatures, the Péan needle, in whose eye the double tube was fastened by a stout silk thread. But its insertion was usually attended with considerable difficulty. The thread tore or cut through the tube, and it was sometimes impossible to draw the distended double tube intact through the uterine stump. After this was effected, it was often difficult to recognize the corresponding ends of the double ligatures. Most of these disadvantages are avoided by the use of Kaltenbach's larding pin. The mode of application of this instrument, which permits the ligatures to be drawn entirely intact through the stump, is evident from the accompanying illustration (Fig. 142). But it is best to avoid the passage of partial ligatures. It is preferable to ligate the tense ligaments separately and to constrict only the central portion of the stump with a rubber tube.

If the ovaries are not situated above the plane of removal of the tumor, they must be withdrawn separately with the tubes, and ligated.

The next stage of the operation consists of the accurate stitching of the peritoneum around the stump. For this purpose the parietal peritoneum in the lower angle of the wound is grasped with a silk thread; this is passed 1 cm. below the posterior surface of the stump behind the elastic ligatures, and then brought out at a corresponding part of the opposite edge of the peritoneum. On tying the thread the parietal peritoneum is closely applied to the serous covering of the stump.

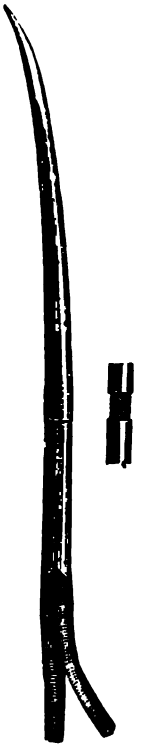

FIG. 142.

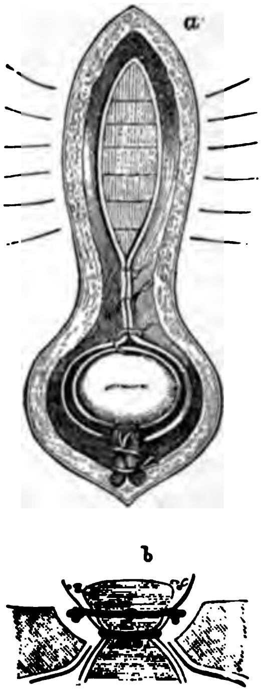

FIG. 143.

The peritoneum is stitched in the same way on the anterior, and, if necessary, the lateral surfaces of the stump. The separately ligated ovarian stumps may also be included in this suture, and may be placed extraperitoneal, but this plan possesses no special advantages. Above the stump (which is covered with peritoneum), and in the direction towards the umbilicus, are inserted three or four sutures, which include the peritoneum alone (Fig. 143); then the abdominal wound is closed in the ordinary manner by alternate deep and superficial sutures. This plan secures rapid and certain closure of the peritoneal cavity. Furthermore, a circular furrow is formed between the abdominal walls and stump, and permits a free view and thorough cleansing of the vicinity of the pedicle. Fig. 143 *b* shows the circular groove around the stump and the position of the elastic ligatures above the peritoneal lining of the stump, in vertical section.

In order to secure the stump firmly, extra-peritoneal, two stout needles are passed, crossing one another, through the stump above the elastic ligatures, and small wads of cotton, enclosed in protective silk, are inserted to protect the abdominal walls.

The portion of the stump situated above the ligatures can usually be reduced materially in size, by removing it with the scissors layer by layer, or by enucleation of individnal fibroma nodules. But this manipulation should not be carried too far, in order to avoid slipping of the ligaments and vessels out of the elastic ligatures. The entire surface of the stump is now cauterized thoroughly with the Pacquelin cautery. Hegar brushes the circular groove around the stump, after carefully checking the hemorrhage and drying it, with a 3 to 10 per cent. solution of chloride of zinc, and then plugs it with sausage-shaped rolls of cotton dipped in a 5 per cent. solution of chloride of zinc. Finally, the surface of removal is brushed with a 100 per cent. solution of chloride of zinc, and the excess is carefully removed. The stump and abdominal wound are covered with carbolized cotton and protective silk, and then a cotton bandage is applied. This is arranged in such a way that the stump and vicinity may be inspected at any time, without disturbing the patient, by merely throwing back the lower border of the bandage.

B. INTRA-PERITONEAL METHOD.

The development of rational intra-peritoneal methods is very recent. The first operations employed combined methods, *i.e.*, the stump was left in the abdominal cavity, but the ligatures or constriction-instruments were drawn out through the lower angle of the wound.

The first attempts at purely intra-peritoneal treatment consisted in the application of silk ligatures *en masse*, with or without previous perforation of the uterine wall. This was soon found to be extremely dangerous. The ligatures loosened or became insufficient from retraction of the pedicle. Many operators lost their patients from internal hemorrhage after slipping of the ligatures. In numerous other cases the constricted uterine stump became gangrenous and formed the starting-point of septic peritonitis. Kaltenbach proposed that the ligatures, in order to avoid slipping, be applied in the form of sutures, which bring the anterior and posterior walls of the uterus in exact contact, and at the same time close completely the entire wound surface of the uterus and broad ligaments. Hegar employed this method successfully in one case, in another sepsis set in, and in a third (partial excision of a horn of the uterus) the hemorrhage could not be controlled by the sutures. Each site of perforation of the needle bled so profusely after the removal of the constricting instrument, that it finally became necessary to withdraw the entire uterus and to perform typical supra-vaginal amputation. The insufficient hæmostasis by simple suture of the wound, is explained by the fact that the vessels are not encircled transversely to their course.

In 1878 Schroeder again recommended suture of the uterine wound after the application of ligatures *en masse* at the level of the internal os. But it was generally necessary to allow these ligatures to remain on account of the continued hemorrhage from the canals of perforation of the sutures, so that the advantage derived from the sutures was lost.

At a later period Schroeder replaced the preliminary ligature of the cervix by isolated ligature of the four large nutrient vessels of the uterus. It is said that after ligature of these vessels the wedge-shaped excision and suture of the uterus were effected in an almost bloodless manner.

Spencer Wells and Kovacs attempt direct ligature of the vessels of the pedicle in the cut surface. Wells grasps the uterus in his pressure-forceps, excises the tumor above it, ligates the vessels in the cut surface, and stitches the edges of the peritoneal wound together by a continuous suture. Before the removal of the compression forceps, he ligates the cervix in two or more parts, and employs further ligature, when necessary, to check the hemorrhage. Kovacs excises the uterine stump in the shape of a funnel, and unites the uterine walls by a double suture, partly superficial, partly deep.

But a decided success was first attained by Schroeder's latest intra-peritoneal method. Its efficiency is chiefly due to the use of provisional elastic constriction. Schroeder first ligates the uterine appendages on one or both sides. The tube and ovary are drawn out by a volsella; then a firm ligature is applied peripherally and centrally around the bundles of spermatic vessels, and they are cut through between the ligatures so that the ovary and tube remain connected with the tumor. The broad ligament is cut as close as possible to the tumor, and the large vessels visible on the surface of the peripheral stump are ligated separately. Then the round ligament receives a double ligature as deeply as possible, and here also the broad ligament is cut through as far as possible. The tumor thus becomes much more movable, and a rubber ligature can easily be passed around the lower part of the uterus. The peritoneum is then cut 5 to 7 cm. above the rubber tube, at first anteriorly, then posteriorly, so that the incisions meet those already present on the sides. The peritoneum always retracts somewhat on account of its elasticity. The tissue at the lateral edges of the uterus is then incised, in order that the uterine arteries may be found and ligated separately. The lower the amputation is performed, the more isolated the vessels are at the sides of the uterus or in its most superficial layers. It is then particularly desirable to ligate them separately, because they are apt to retract into the loose, parametral cellular tissue after removal of the rubber ligature. If the amputation is performed higher, the uterine arteries have generally divided and several ligatures are necessary. As a general thing it is not very difficult to find these vessels. The uterus is at once removed in layers at the same level, and the uterine cavity is disinfected, immediately after it is opened, with a 10 per cent. solution of carbolic acid. Schroeder now opens the uterus and cervical canal with the thermo-cautery in order to destroy all germs which may be present. If it is necessary to excise the uterus a little above the rubber ligature, the edges of the stump are fixed anteriorly and posteriorly with Museux's forceps, and are drawn somewhat asunder in order to prevent slipping of the ligature. Parts of the myoma which may have been left behind are now removed with the knife and scissors, and the uterine cavity closed by a series of sunken sutures. The stump is then sutured in several strata, according to the extent of the cut surface, the threads are cut off short, and finally the peritoneum is united over the entire part. If the tension is very great the rubber ligature may be removed or loosened before the application of the last series of sutures. The hemorrhage is usually slight, and, as the uterus may be drawn forward at will by means of the last series of sutures, it may readily be compressed with the hands, if necessary, until further ligatures are applied.

The peritoneal sutures may often be applied more favorably after the removal of the rubber tube than before. Gaping wounds of the broad ligaments or the retracted edges of the peritoneum at the border of the uterus are closed by a few sutures. The threads are then cut off short, the pedicle replaced, and the peritoneal cavity well cleaned.

Schroeder now stitches the stump with a continuous suture; sublimatized catgut, preserved in oil of juniper, is used instead of silk.

Figs. 144 and 145 show the conditions which obtain after the operation, as seen in section from above. On both sides of the pelvis at the level of the linea innominata are seen the stumps of the infundibulo-pelvic ligaments with the ligated spermatic vessels (Fig. 145, *aa*); immediately adjacent and a little below the ligated stumps are the round ligaments (*bb*). From this point passes a narrow wound fissure, corresponding to the opened broad ligaments, to the sides of the uterine stumps, over which passes a linear wound closed by numerous fine sutures.

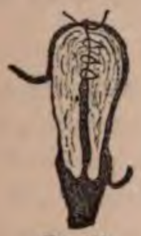
FIG. 144.

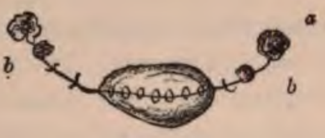

FIG. 145.

The attempt has been made, in several cases, to replace in the peritoneal cavity the ligated stump, together with the elastic ligatures. Czerny first adopted this plan; the case terminated fatally. In three cases Hegar ligated the stump in two halves with elastic ligatures and replaced it. Recovery occurred in two cases but not until an abscess had formed around the pedicle. In the first case the abscess ruptured through the abdominal wound, in the second through the cervical canal into the vagina, and the elastic ligatures and pedicle were also passed through the same channel. In Ahlfeld's case the elastic ligature and clamps escaped through the vagina at the end of nine weeks, after prolonged suppuration. Fritsch has recently stitched the stump according to Schroeder's method, and then replaced it with the constricting elastic ligature. Of four cases treated in this way only the first terminated fatally. Kaltenbach also employed this combined method in one case, but in such a way that the middle portion of the stump should not be shut off entirely from the circulation. Only the lateral portion of the cervix, with the ligaments and the bundles of the spermatic and uterine arteries, were surrounded by elastic ligatures. The middle portion of the stump remained free, was excised in a wedge-shape, and stitched. Necrosis of the pedicle occurred despite careful disinfection of the cervical canal. After recovery had run a favorable course for two weeks, an abscess developed around the stump. A loop of intestine became adherent to the wall of the abscess and was bent at an angle. The patient died of intestinal occlusion on the fourteenth day after the operation.

C. Modifications of the Operation under Special Conditions.

Supra-vaginal Amputation in Malignant Tumors of the Body of the Uterus.

In such cases Hegar always fastens the stump extra-peritoneal in the previously described manner. The resistance of the sacro-uterine ligaments, the peritoneum of the posterior part of the pelvis and the pelvic fascia, generally offers greater obstruction to the withdrawal of the uterus than in myomotomy, in which these parts have been distended by the growth of the tumor. In order to make these parts yield, Hegar employed preliminary treatment, consisting of the introduction of colpeurynters and pessaries, and manual elevation or careful depression of the portio vaginalis. In these cases, the surface of excision of the stump need not lie at the level of the abdominal integument. It is sufficient to stitch the stump on all sides with parietal peritoneum in the lower angle of the wound, while it is prevented from slipping back into the pelvis by means of curved fixation needles or by tying it to a glass rod which is placed transversely across the abdominal wound.

Schroeder's cases date back to an earlier period, and the old method of isolated ligature of the four main bundles of vessels was employed.

Of seven abdominal supra-vaginal amputations performed on account of cancer and sarcoma, two terminated fatally. Of the remaining five, four were healthy at the end of two and a half to five years.

The only supra-vaginal amputation through the vagina was performed by Schroeder in a case of cancer of the body of the uterus, complicated with prolapse. The anterior vaginal wall was markedly prolapsed, the cervix was long and flabby, and the thickened uterus was retroflexed. Douglas's sac was opened through the vagina, the body of the uterus drawn down and amputated supra-vaginal, and the cervical stump stitched to the opened fornix of the vagina. Undisturbed convalescence.

Operative Treatment of Uterine Cysts.

Péan operated in the following manner upon three cases of uterine cysts. After puncture of the tumor (7 to 10 litre contents) and separation of extensive adhesions, a wire loop was drawn around the uterus as low as possible, the larger part of the sac was removed and the funnel-shaped remainder was stitched into the lower angle of the wound. A canula was introduced permanently to the bottom of the sac. Péan left the ovaries *in situ*, although the ages of the patients were respectively twenty-four, thirty-six, and forty-one years. In the first two cases the menses returned and were discharged partly through the abdominal cicatrix.

In the fourth case described as uterine cyst (sarcoma with hydrometra?) typical supra-vaginal amputation was performed successfully.

MYOMOTOMY WITH ENUCLEATION.

Enucleation of Sub-mucous and Intra-mural Myomata of the Corpus, with Retention of the Uterus.

In 1879 Martin devised a plan for enucleation of sub-mucous myomata through the abdominal cavity. This method was to be employed in those cases in which removal through the vagina was impossible, on account of the narrowness and length of the cervix, and when the patients were very anxious to retain the integrity of the sexual organs. Then Martin extended this indication to solitary, interstitial myomata, which were surrounded on all sides by intact muscle, provided that careful palpation did not disclose myoma nodules in other parts. After elastic constriction of the cervix, the uterus was incised as in Cæsarean section, the tumor was enucleated, and the bed of the myoma and the uterine wound closed with sutures.

The cavity left by the tumor generally diminishes in size so markedly, that its walls may be applied closely to one another by means of large needles which are passed through beneath the entire wound surface. In addition to deep sutures (catgut, if necessary, and inserted in strata), a few superficial sutures produce accurate coaptation of the peritoneal edges.

The uterine cavity generally remains entirely intact. But if it has been injured or incised, the mucous membrane must be closed with a special series of sunken sutures, after careful disinfection. If the tumor is situated in the posterior uterine wall, or if nodules are extirpated anteriorly and posteriorly, the mucous membrane may receive a double incision.

When the cavity of the tumor was very large, Martin passed a large drainage tube through the external os into the vagina, and inserted the sutures over the tube. In several cases resection was performed of that part of the wall of the cavity which could not be included conveniently in the sutures.

Martin had three deaths among eight operations. Schroeder's case recovered.

Important objections may be raised against this method of operation. In the first place large tumors may develop from unnoticed myoma nodules. This occurred twice in Martin's cases, in one of which he was compelled, at a later period, to perform supra-vaginal amputation.

Martin's recent recommendation that this renewed development of myomata be prevented by castration, is entirely rational, but it disposes of the original basis of the operation, *viz.*, the retention of the integrity of the sexual apparatus. The question then arises whether castration alone would not suffice, or whether typical supra-vaginal amputation would not create more favorable conditions of the wound than enucleation combined with castration.

Another objection, though one that has not been confirmed hitherto by experience, is the long duration of the compression by the elastic tube, which is apt to give rise to extensive thrombosis within the uterine walls, and the included varicose ligaments, thus exposing the patient to the danger of pulmonary embolism.

Enucleation of Intra-mural Myomata of the Cervix.

A second group of myomotomies with enucleation include the interstitial myomata which have developed deep within the tissue of the cervix.

In such cases there is no pedicle which may be treated in the typical manner, and usually it is even impossible to place a constricting tube provisionally around the base of the tumor. Enucleation constitutes the only possibility of reaching the tumor. In such cases the enucleation is performed on account of the position of the tumor and not voluntarily, as in Martin's operation. Fig. 146 and 147 (after Breisky and Hofmeier) illustrate these tumors, which fortunately are almost always found singly.[1]

After incision of the muscular covering enucleation is often unexpectedly easy, as the connections consist usually of loose cellular tissue. If the incision is made in the median line the hemorrhage is usually slight, particularly if the muscular mantle is thin.

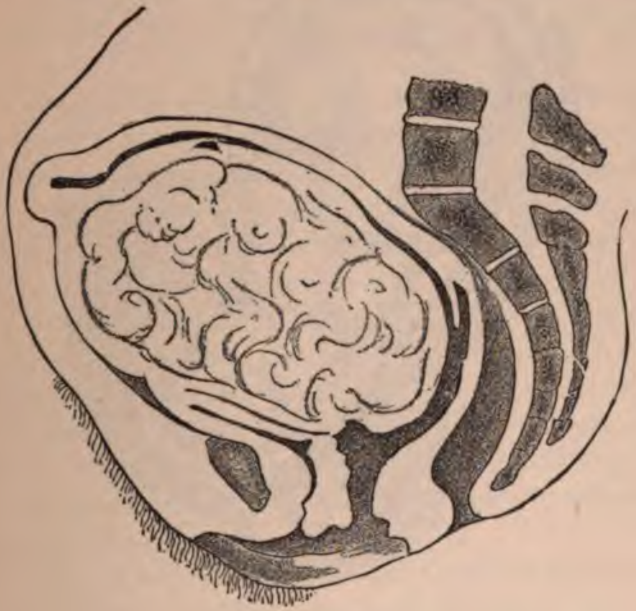

FIG. 146.

After enucleation has been performed the operation may be completed in two ways. The former bed of the tumor may be drawn together by numerous sunken sutures, and the walls of the muscular covering united by superficial sutures, or the constricting tube is applied and supravaginal amputation is performed in the usual way.

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[1] Fig. 146 represents a typical myoma of the anterior wall of the cervix; Fig. 147 is a large intra-mural myoma of the posterior wall of the uterus, which has grown downwards into the cervix.

We regard the second method as more rational, because it furnishe simpler wound conditions, and because we attach less importance to the maintenance of the integrity of the sexual apparatus.

Our scanty experience concerning the operative treatment of these large myomata of the cervix, decidedly favors the combination of typical supra vaginal amputation with enucleation.

Among five cases of suture of the bed of the tumor, with retention of the uterus, Schroeder lost three, two from internal hemorrhage and shock in three and a half and eight hours respectively after the operation, the third from septic peritonitis on the fifth day. Two cases, in which he completed the operation by amputation of the uterus, and intra-peritoneal treatment of the pedicle, terminated favorably; this is also true of three cases of Gussenbauer and Breisky, which were completed by supra-vaginal amputation with extra-peritoneal treatment of the stump.

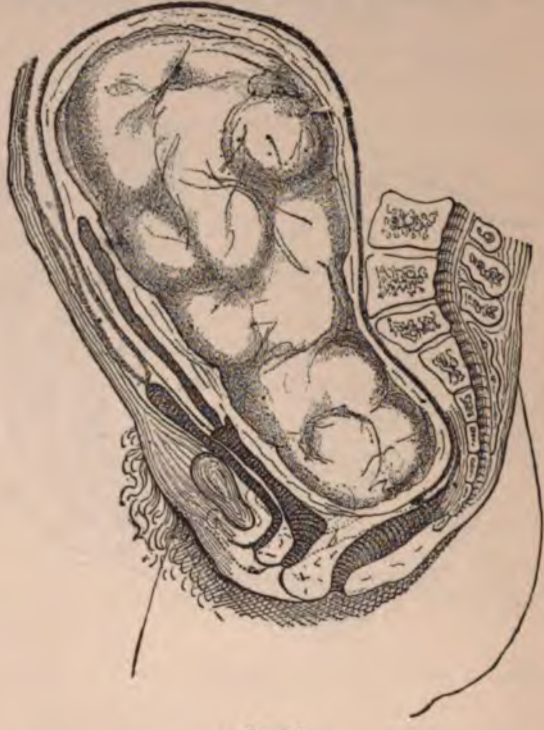

Fig. 147.

Enucleation of Intra-ligamentary Myomata.

On account of the great differences in the individual conditions, the general features of the operation alone can be described.

The preliminary application of a rubber tube is impracticable, because the base of these tumors is too large and the peritoneum hardly ever folds over until it reaches the level of the entrance to the pelvis, or far above it on the tumor. Moreover, the rubber tube would be very apt to include the bladder, which is drawn upwards, and even the descending colon.

After rolling out the top of the tumor, the spermatic bundles of vessels are first ligated. From here the capsule of the tumor is cut transversely, and its edges fixed with push forceps. The capsule consists essentially of thickened peritoneum, to which a thin layer of the uterine muscle may be applied internally. The connections of the capsule are usually so loose that it may be removed from the tumor with the rounded blade of a pair of scissors. The base of the bladder, which is often drawn upwards, is avoided by a convex divergence of the incision. Vessels within the peritoneal covering and the distended round ligaments receive a double ligature and are then cut. The tumor is now separated from its bed with the fingers. In rare cases stout fibrous bands require the aid of the knife or scissors. Great caution is necessary in separating it anteriorly in order to avoid rupture of the bladder.

The tumor may sometimes be enucleated freely out of the broad ligament, without any connection being found between it and the intact uterus. But the growth is generally adherent to the uterus over a greater or lesser area, sometimes in an annular shape. In certain cases, however, a slender cervix is found after enucleation of the tumor, even if the entire pelvis was filled with nodular tumor masses and the portio vaginalis had been entirely effaced.

Enucleation from the pelvic cellular tissue is generally effected without notable hemorrhage. Spirting vessels, or those which are visible before section, are tied or cut after receiving two ligatures. After ligature of the spermatic bundles we need not expect to find larger vessels until we reach the lateral border of the uterus. If the tumor was situated free in the broad ligament or was connected with the uterus merely by a thin pedicle, the uterus may be left intact. The large wound cavity is closed by simple sutures, or is stitched to the uterus, if necessary, after shortening the envelope of the tumor. If the cavity cannot be closed entirely or the hemorrhage is not completely checked, drainage through the vagina becomes necessary.

If the tumor adheres to the uterus over a large area, the removal of the organ cannot be avoided. As soon as enucleation has progressed to the neighborhood of the cervix, a rubber tube is applied, constricting the second main group of nutrient vessels, both uterine arteries. Typical supra-vaginal amputation is then performed above the elastic ligature. The stump may be treated extra-peritoneal or intra-peritoneal.

In the latter event the bladder, which may have been separated, is first stitched to the uterine stump, and sunken sutures are then passed through the latter and the peritoneal edges of the pelvic wound.

In one case Eck dissected out a peritoneal flap, 12 cm. in length, from the anterior wall of the tumor, cut through the uterus with the galvano-cautery, applied ligatures *en masse* to the vessels on both sides, placed the peritoneal flap over the stump, and stitched it to the peritoneum of Douglas's sac. Recovery after perforation of a pelvic abscess.

Extra-peritoneal treatment of the stump was regarded formerly as impossible, because a distinct cervix appeared to be entirely absent in intra-ligamentary tumors. On the contrary, however, it may usually be done very readily, because the cervix, which is almost always intact, is pushed upwards by the tumor, which has grown downwards in the pelvic cellular tissue, and becomes extremely movable because it is fastened exclusively to the fornix. A special indication for extra-peritoneal treatment is furnished by rupture of the bladder during the operation, inasmuch as the yielding of a suture may lead to urinary infiltration of the pelvic and abdominal cavities, after the sutured bladder has been replaced.

The large wound cavity between the folds of the broad ligament can rarely be closed accurately down to its base. It must therefore be separated from the abdominal cavity by suture of the peritoneal edges, and must be drained into the vagina. For the latter purpose a stout volsella is pushed from the floor of the parametral wound surface through the fornix, and by means of this instrument a rubber tube with transverse arms is drawn into the wound cavity. Kaltenbach operated successfully, according to this method, in the following case:

Intra-ligamentary myoma weighing 14 pounds. Both broad ligaments completely unfolded. Almost the entire pelvis filled by a nodular tumor, which pushes the effaced portio vaginalis above the right horizontal ramus of the pubis. The base of the tumor occupies the entire entrance of the pelvis. The peritoneum passes over to the tumor at the height of 5 cm. above the entrance of the pelvis on all sides.

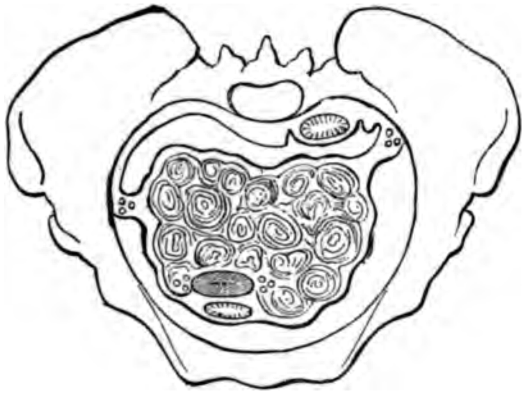

FIG. 148.

Ligature of the left spermatic bundle in the left sacro-iliac region, of the right bundle on the right side. Transverse incision through the peritoneum around the entire base of the tumor. Blunt enucleation of tumor without notable hemorrhage. Rupture of bladder closed by 16 to 20 sutures. After enucleation of the nodular myoma masses, the tumor, which starts solely from the body of the uterus, is connected with the pelvic organs by a narrow cervix. Constriction of the latter and of the adjacent uterine arteries with an elastic ligature; excision above the ligature. Extra-peritoneal fixation of the stump with lance-shaped needles, which also produce extra-peritoneal fixation of the base of the bladder. Anteriorly and posteriorly the separated peritoneum of the folds of the ligament is stitched to the bladder and uterus. Laterally the anterior and posterior folds

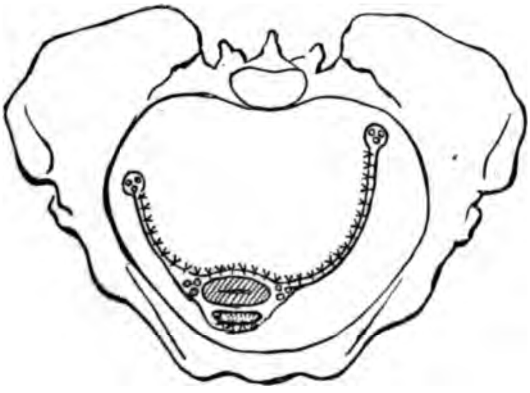

FIG. 149.

of the ligament are coaptated with sutures. Drainage, into the vagina, of the thoroughly disinfected bed of the tumor, which is much deeper on the left side. Figs. 148 and 149 show the topographical relations before and after the operation; undisturbed, almost apyrexial convalescence.

The colossal wound in the pelvic cellular tissue may also be excluded from the abdominal cavity by drawing forth and stitching the widely separated peritoneum, particularly the posterior fold of the broad ligament, into the lower angle of the wound. Péan did this repeatedly in cases of "peri uterine fibroma." At the same time he treated the uterine stump extra-peritoneally, and drew the compression instruments, which had been applied to the pelvic vessels, through the lower angle of the wound.

Kuester has modified this plan by stitching into the lower angle of the wound the entire circumference of the peritoneal sac, formed of both layers of the broad ligament. The uterine stump, which was excised and sutured in the ordinary manner, remained at the bottom of the sac. The latter was tamponed and drained with iodoform gauze, partly for disinfection, partly to check the hemorrhage.

In extirpating an intra-peritoneal fibroid of the cervix, Thelen secured closure against the abdominal cavity by joining the parietal peritoneum on both sides to the peritoneal edges of the capsule of the tumor (which was incised longitudinally), so that the subsequent extirpation of the tumor was extra-peritoneal.

CRITICISM OF THE EXTRA-PERITONEAL AND INTRA-PERITONEAL METHODS.

At the present time the question of treatment of the pedicle is only important with regard to supra-vaginal amputation of the uterus. Opinions are now less decided, and no one attempts to decide the question *á priori*.

The advocates of the intra-peritoneal method make a very sharp distinction between myomotomies with and those without opening of the uterine cavity. They now recognize the special dangers of supra-vaginal amputation, which are due to the anatomical character of the uterine stump.

We will first attempt to shed the light of statistics on the methods in question. This is not an easy matter. Large tables may not be employed on account of the dissimilar character of the cases and the methods of operation, and because operations with and without opening of the uterine canal have not been kept sufficiently separate. We are therefore restricted to the series of operations of individual surgeons, since these have been performed under tolerably uniform external conditions. But even these are not of equal value. They include operations of former and recent times; the method of operation, the technique and antiseptic precautions have been gradually improved. The indications, and therefore the gravity of the operations, vary greatly. On this account we adduce the following statistics with a certain amount of reserve. Unless special mention is made, supra-vaginal amputations alone are referred to.

1. *Intra-peritoneal Method.*

Schroeder, . . .	58 operations with 18 deaths
Olshausen, . . .	29 " " 9 "
Martin, . . .	28 " " 9 "
	115 operations with 36 deaths (31.3%.)

2. *Extra-peritoneal Method.*

Hegar, ...	22 operations with 6 deaths
Kaltenbach, . . .	13 " " 1 death
Keith, ...	24 " " 2 deaths
Bantock, . . .	15 " " 1 death
	74 operations with 10 deaths (13.5%.)

It is also noteworthy that among Hegar's five cases of intra-peritoneal treatment, there were three deaths, among Kaltenbach's three cases two deaths, and among Bantock's six cases five deaths.

Hence, there can be no doubt from the foregoing figures that the extra-peritoneal method has hitherto furnished better results.

The cause of the failure of the intra-peritoneal method, which is so successful in ovariotomy, must be sought in the peculiar anatomical conditions of the uterine stump. This differs from the pedicle of an ovarian tumor in the following essential features: it is much more massive and generally contains much larger vessels. In addition to the spermatic vessels, the trunks or main branches of the dilated uterine arteries are found at the level of the amputation. The uterine stump contains a canal, lined with mucous membrane, which is usually dilated in large myomata, and into which infectious germs are extremely apt to enter from the vagina, partly spontaneously, partly as the result of diagnostic and therapeutic manipulations. This possesses an entirely different significance from the narrow tube in ovarian pedicles, which is much less frequently the site of infectious germs. These anatomical conditions give rise to the great difficulty in keeping the stump aseptic and in checking the hemorrhage.

The recent improvements in intra-peritoneal methods consist of the isolated ligature of the main bundles of vessels, of suturing the surface of amputation and covering it with peritoneum, and of precautions against infection from the cervical canal.

Isolated ligature of the vessels presents the great advantage over constriction of the stump *en masse*, that a ligated portion in the ordinary sense is not formed. The middle portion of the stump, in Schroeder's operation, is nourished by branches of the uterine arteries, given off centrally from the point of ligature, but is vascularized to such a moderate extent that simple sutures usually suffice to check the hemorrhage. But in the fullest sense this is true only of the cervix, not of the body of the uterus.

The middle portion of the stump, which is not deprived entirely of blood, is not so apt to undergo necrosis, and offers favorable conditions for union by first intention Finally, the peritoneal envelope separates the central part of the stump from the peritoneal cavity, and adhesions are not so apt to form between the incised surface and adjacent organs. The chief danger of infection of the stump through the cervical canal or vagina is combated by excision of the mucous membrane (Olshausen), or its destruction with the actual cautery or caustic disinfectants. At the same time the greatest attention is paid to disinfection of the vagina and uterine cavity before the operation. There has thus been developed a method of treatment adapted to the peculiar anatomical conditions of the uterine stump, which is entirely different from that of the ligature *en masse* employed in ovariotomy, so that all analogy between intra-peritoneal treatment of an uterine stump and an ovarian pedicle ceases.

Despite all improvements intra-peritoneal treatment of the stump does not offer the same certainty against hemorrhage and sepsis as extra-peritoneal treatment. Some patients still succumb to internal hemorrhage, although it must be acknowledged that this danger has become very slight in the hands of experienced operators. Sepsis often results from the fact that small quantities of blood oozing from the stump, decompose under the contact of the cervical secretion, and that the sutured surfaces do not heal by first intention. Certain disinfection of the entire cervical canal is almost impracticable. The injections of iodoform emulsion employed by Olshausen before the operation are by no means sufficient for this purpose. Even the actual cautery destroys infectious germs only momentarily, and leaves an eschar, which forms an extremely dangerous material for decomposition.

Still more frequent is the formation of abscesses around the pedicle at a later period. These are mainly the result of inflammation-producers which enter through the cervical canal. A very important factor is the large amount of suture material required, and on account of which the middle portion of the stump, which theoretically continues to be nourished, is very apt to be excluded entirely from the circulation. Schroeder's continuous catgut suture owes its advantages not alone to the saving of time. Martin has also observed unpleasant results from the large number of sutures, and complains that they continue to pass through the rectum, bladder, cervical canal and abdominal wound for months and years after the operation. Hence he employs woven catgut for the superficial sutures.

Hegar's extra-peritoneal method offers absolute security against the hemorrhage. It also prevents primary infection of the pedicle, whether through the abdominal cavity or the vessels of the pedicle. The possibility of late infection through the thrombosed vessels of the pedicle can be excluded with less certainty.

In the extra-peritoneal operation the chief importance is attached to the exclusion of infectious germs and decomposition-producers from the cervical canal. But if the pedicle, despite every precaution, does undergo decomposition, the extra-peritoneal plan offers the great advantage that the products of decomposition escape externally, and that the infectious germs which enter from the outside or from the cervical canal may be rendered innocuous.

The disadvantages of the extra-peritoneal operation are the long duration of the after-treatment and the liability to abdominal hernia. On the other hand the operation technically is decidedly easier. Exact intra-peritoneal treatment of the stump requires longer time, a feature which is attended with danger in various directions.

Our views may be summed up as follows:

At the present time the extra-peritoneal method offers the greatest chances with regard to life.

From the recent improvements in the intra-peritoneal method, it may be foreseen that the latter plan will, in the future, secure equally good results. If this point is reached, the preference should be given to the intra-peritoneal method, because it can be adapted better to the peculiarities of the individual case, while the extra-peritoneal operation generally requires a narrow cervix; even now the former operation is indispensable in some cases. It necessitates briefer after-treatment, and offers greater security against abdominal hernia.

But it is improbable that the extra-peritoneal method will ever be displaced entirely, inasmuch as it is performed easily and quickly in favorable cases, and because it presents peculiar advantages under certain conditions, for example, in injury to the bladder or when the uterus is excised near the fundus.

TERMINATION OF THE OPERATION.—AFTER-TREATMENT AND COURSE.

Peritoneal toilette usually is finished quickly in myomotomy. The abdominal cavity is rarely soiled by the contents of the tumor or by blood oozing from the surfaces of adhesions, and with care the entrance of blood from the abdominal wound or from the cut tumor can almost always be avoided. We have never employed drainage of the abdominal cavity, but we have sometimes introduced a drainage tube into the sutured bed of intra-ligamentary tumors. In opposition to all other writers Martin recommends prophylactic drainage of the abdominal cavity after operations for myomata. He justifies this plan on the ground that extensive transudation occurs after an operation which occludes such large vascular tracts. Furthermore, the absorptive power of the peritoneum is apt to be insufficient in these patients, who are exhausted by the protracted disease, and hence stagnation and decomposition of the exuded masses are favored.

Whenever the uterine cavity has been opened we again wash the vagina, immediately after the operation, with sponges dipped in a solution of corrosive sublimate (1:1000) and insert an iodoform tampon.

The closure of the abdominal wound, dressing and after-treatment are subject to the same rules as in other laparotomies.

Special consideration must be devoted to those measures intended to protect the extra-peritoneal pedicle from decomposition. Péan brushed the pedicle with liq. ferri sesquichl. to effect this object. This produces merely a firm crust on the surface of the stump, without preventing decomposition internally. Better results are obtained by chlorinated water in the form of frequently changed compresses or permanent irrigation. The first symptoms of decomposition could not be delayed beyond five days, but this period was generally sufficient to secure closure of the abdominal cavity and the vessels of the pedicle. On the other hand, the mode of application of the remedy caused wetting of the patient and an annoying effect upon the respiratory organs. Hegar's treatment with chloride of zinc, described above, constituted a great advance. The impregnated cotton in the groove around the stump was renewed as soon as it was wet through, and for some time all parts of the stump within reach were brushed with a solution of chloride of zinc (5 to 10 per cent.) at each change of dressing. If this plan is carried out properly, the stump dries, on the second or third day, into a hard, occasionally horn-like mass. But the frequent application of the chloride gives rise to extensive crusting of the funnel-shaped wound, and even of the abdominal walls, if the remedy spatters. In addition the chloride of zinc often excites, during the first dressing, renewed hemorrhage; blood of the color of sealing-wax accumulated wherever the fluid was applied. The application of the first dressing was therefore tedious, and it often became necessary to renew it on the first day, because it was soaked with blood and transuded serum. As a rule, two subsequent dressings were required. The exfoliation of the crust was often attended by abundant suppuration.

In order to avoid these disadvantages, Kaltenbach employed permanent dressings with iodoform, but these were very apt to induce symptoms of poisoning in anæmic individuals or when the abdominal walls were obese. He therefore adopted Freund's mixture of tannin and salicylic acid (3:1), which acted admirably in three cases. The after-treatment is then considerably simplified. At the close of the operation the groove around the stump is dusted with the mixture and then plugged with cotton. The powder is also strewn over the surface of the stump, after the cervical canal, which has been excised in the shape of a funnel, has been disinfected with corrosive sublimate or chloride of zinc. The whole is then covered with cotton. This dressing checks forthwith all hemorrhage in the wound; the "tanned" stump dries into a black leathery mass; a minimum crusting of the abdominal walls takes place. This dressing may be left eight to ten days, unless it requires looking after, on account of elevations of temperature or profuse secretion. It is even difficult to remove it before this time, because it adheres very firmly to the groove around the stump. In this way the wound obtains the greatest amount of rest; it is protected from the traction incident to the shortening and cutting of the stump formerly employed.

The stump occasionally presents a decided tendency to retraction for a few days. The needles employed for fixation press deep grooves into the skin, and fresh cotton must then be placed beneath them.

The spontaneous exfoliation of the stump with or without the adherent elastic ligatures generally occurs at the end of the third week. If it is merely adherent by a thin band, this may be cut with the scissors.

The funnel-shaped wound diminishes in size very rapidly after the exfoliation of the stump and ligatures, and becomes entirely closed by a slightly retracted cicatrix. A fistula between the abdominal walls and cervical canal sometimes remains. If the ovaries are retained, the menses are sometimes evacuated through such a fistula or through the thin cicatrix, which reopens at intervals.

In almost all of our cases of recovery the course was nearly apyrexial. As a rule elevations of temperature resulted from changes in the stump; there was either retention of secretion in the cervical canal, or beginning decomposition in the immediate vicinity. Immediate fall of the temperature could almost always be effected by renewed thorough disinfection.

A sero-bloody discharge from the vagina appears very often on the second to fourth day, and from the same causes as after ovariotomy and castration. With our present disinfectant measures we have never found the discharge to be foul-smelling.

In favorable cases the patient may leave the bed at the end of three weeks. As a protection against abdominal hernia we apply bandages, which protect the cicatrix in the lower angle of the wound by a large, soft-cushioned pad.

DANGERS OF MYOMOTOMY.—SUBSEQUENT CONDITION OF THE PATIENTS.

On account of the advances in the methods of operations, the prognosis of myomotomy has improved with surprising rapidity, but it nevertheless remains a much more serious operation than ovariotomy. This is owing to the inability of fibromata to diminish in size, to the sudden relief of the abdominal organs from pressure, the extensive development of vessels and the anatomical character of the uterine stump. The general condition, moreover, is greatly impaired in not a few cases by the losses of blood, and the marked compression-phenomena. A favorable feature is the rare presence of adhesions or of decomposable tumor contents.

The causes of death are the same as in other laparotomies, but their proportions are different.

A considerable percentage of the mortality is the result of shock and collapse, whose occurrence is favored by the course of the operation, the heart failure resulting from the protracted hemorrhages and other organic affections. Some patients succumb rapidly to symptoms of cerebral anæmia or pulmonary embolism after the removal of large tumors. In two cases Howitz observed severe shock during the constriction of the stump with the clamp. The danger of death from hemorrhage has been greatly diminished by the recent improvements in the method of operation, while eight fatal hemorrhages occurred among the thirty-five cases collected in 1864 by Koeberlé. Death from hemorrhage has occurred repeatedly upon the operating table from rupture of the tense ligaments in taking out the tumor or injury with the constricting instruments. Threatening hemorrhages have also resulted from tearing or slipping of the wire loops during morcellement or constriction of the cervix. But fatal hemorrhages occur most frequently in twelve to thirty-six hours after the operation, from slipping or insufficiency of the ligatures. Hemorrhages have been observed on the third to eighth day after enucleation of intra-ligamentary tumors, while removing forceps, which have been left behind, or during the exfoliation of the compression-eschar, to which they have given rise. But at the present time the bleeding is hardly ever dangerous, except when patients, suffering from anæmia or cardiac weakness, are unable to rally from the loss of blood during the operation or succumb to the slight oozing from the stump or pelvic wound.

Sepsis constitutes the greatest danger. It may appear acutely, immediately after the operation, and then depends generally on external infection of the peritoneum or stump. In other cases it develops more slowly after the patient has felt well for some days. Then a local focus of inflammation first develops, and this gradually infects larger parts of the peritoneal cavity, or the vessels of the pedicle. The latter form depends chiefly on self-infection through the cervical canal or vagina.

The complications after myomotomy include circumscribed peritoneal exudations and abscesses around the pedicle, which may perforate through the vagina, bladder, rectum, abdominal wound, or into the peritoneal cavity. Furthermore, extensive thromboses of the veins of the pelvis and thighs with all their sequelæ. Fatal pulmonary embolism has been observed repeatedly. Death occurred sometimes from hypostatic pneumonia or capillary bronchitis, and from advanced disease of the kidneys and renal pelves, which had been overlooked before the operation. Intestinal occlusion has been observed repeatedly. This may result from angular flexion of the intestines, which had become adherent to the surface of the stump or to a suppurating focus in the vicinity. In other cases of extra-peritoneal treatment of the stump, the intestine was constricted laterally by a band of omentum, or by the tense edges of the broad ligaments.

Péan and Wood mention intestinal perforation. Rose observed a fæcal fistula, which was left over after the operation, from some unknown cause.

Injury to the bladder may be followed by fatal urinary infiltration, if the sutures give. In Pippings-Kjoeld's case an uretero-abdominal fistula remained. Tetanus has been observed after the application of the clamp and intra-peritoneal treatment of the pedicle. In Chadwick's case the abdominal wound ruptured during a spasmodic attack, and the protruded intestines were replaced with difficulty. Death on the sixth day. Lossen and Fuerstner report a case of acute mania which developed six days after hysterotomy, and recovered quite suddenly at the end of six weeks. The operation had been performed a short time before the expected menstruation.

As a rule, the women remain well after recovery from myomotomy, although abdominal herniæ result not infrequently. It can not be denied that their occurrence is favored by the broad, smooth cicatrix after extra-peritoneal treatment of the stump. But a great part is also played by other factors, such as the social position of the patient and the marked development of adipose, which is observed not infrequently after the operation. The deposit of fat in the abdominal organs enlarges the transverse section of the abdominal cavity and distends their walls under increase of the intra-abdominal pressure, while, on the other hand, the deposit of fat within the abdominal wall exercises decided traction on the thin cicatrix.

A relapse may occur after extirpation of apparently benign fibromyomata. Thus, Kaltenbach observed a relapse in the abdominal cavity six months after removal of a fibromyoma which was softened over a small area. The fourteen pound tumor had grown rapidly in the three months prior to the operation, but had developed from an intra-mural myoma, which was under observation for ten years. The case was evidently one of sarcomatous degeneration.

The subsequent condition of sexual life depends upon whether the uterus was retained and whether the ovaries were also removed or not. The mode of operation also exerts an influence. We refer to the possibility of extra-uterine pregnancy when there is a communication between the cervical stump and abdominal cavity; to the formation of catamenial hæmatoceles, and the rare menstruation through the abdominal cicatrix after extra-peritoneal treatment of the stump

Bardenheuer has performed total extirpation of the uterus in several cases of fibroma in which supra-vaginal amputation could have been performed. He desired to avoid gangrene of the uterine stump, and to render possible the free escape of peritoneal secretion through a wide opening. Closure of the peritoneal opening was to be prevented, and parenchymatous hemorrhage from the edges of the vaginal wound checked by stitching the pelvic peritoneum to the vaginal walls. This plan has not been adopted by any other operators.

Other operations have also been performed in uterine myomata. The attempt has been made to produce adhesions between the tumor and abdominal walls, and then to cause suppuration of the tumor and elimination externally. Walker adopted the following method in a fibroma which filled the entire abdominal cavity. A large trocar was pushed into the tumor and allowed to remain for several days. Then a second instrument, with diverging blades, was introduced and the tumor torn. The patient passed through a severe attack of peritonitis, but the tumor is said to have disappeared almost entirely, leaving an abdominal fistula.

Messbaum recommended an operation in two stages in certain cases. In a case of gangrenous myoma, which could not be removed by the natural passages, he first divided the abdominal walls, stitched the parietal peritoneum to the cutis, and then the uterine walls to the edges of the wound. Three days later, the uterus was divided with the thermo cautery and the tumor removed. The patient died of gangrenous peritonitis.

MYOMOTOMY THROUGH THE VAGINA.

Some sub-serous cervical myomata situated in Douglas's sac and certain intra-ligamentary tumors project so strongly towards the fornix of the vagina that they may be removed through the latter organ. The extirpation of such tumors is generally rendered necessary by the violent compression of the pelvic organs. In extra-peritoneal location of the tumor in the pelvic cellular tissue, vaginal myomotomy is theoretically preferable to laparotomy, but the differential diagnosis of the exact location can rarely be made before the operation.

In a case of sub-peritoneal uterine fibroid which filled the entire right half of the pelvis, Sutton incised the posterior vaginal wall, and thus came directly on the tumor, which was inserted in the posterior wall by a broad pedicle. After cutting the pedicle the tumor was removed with obstetric forceps; a few loops of intestines then protruded. The pedicle was tied with two ligatures, and the peritoneal opening stuffed with sponges to retain the intestines; death from peritonitis four days later. The autopsy showed perforation of the small intestine.

Van Derveer removed through the vagina a retro-uterine tumor, weighing 325 grm., which had given rise to œdema and retention of the urine by pressure on the pelvic vessels. After incision of the posterior fornix, the tumor was drawn with a small pair of forceps in front of the vulva, and at the same time, though unintentionally, the uterus, broad ligament and ovary. The capsule of the tumor was opened and the growth enucleated without cutting the peritoneum (?). Closure with silk sutures, recovery in six weeks.

Four successful extirpations through the vagina are reported by Czerny, Ljocis and Lomer. Caselli removed, through the vagina, an intra-ligamentary tumor weighing 1400 grm. and connected with the uterus by a pedicle. Incision of the pedicle, the violent hemorrhage checked with Pacquelin cautery, drainage, recovery. Mikulicz removed a sub-serous tumor as large as an orange, after enucleation of a large interstitial myoma. The peritoneal cavity was opened and a portion of the peritoneal covering of the uterus removed. The peritoneal wound was stitched to the protruded uterus.

PARTIAL EXTIRPATION OF THE UTERUS THROUGH THE VAGINA. —AMPUTATION OF THE CERVIX.

HISTORY AND INDICATIONS OF THE OPERATION.

Extirpation of the lower part of the uterus was first performed in cases of malignant tumors. Marshall's first operation (1783) was a partial excision of a prolapsed, cancerous uterus. In 1801, Osiander and performed amputation of the cervix *in situ* in a case of cancer.

In 1813, Rust of Vienna repeated Osiander's operation, but the patient died. Later, extirpation of the cancerous cervix was recommended chiefly by French surgeons, but the sanguine expectations soon proved illusory. At the beginning of the sixth decade of this century, the methods of operation were improved, and a more careful selection of cases was made.

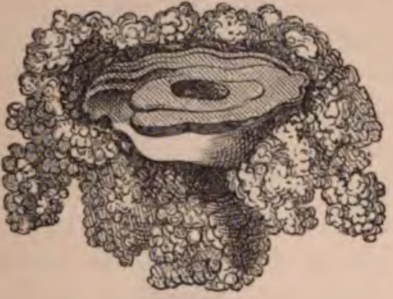

FIG. 150.

Gusserow reports a series of radical cures by early operation. Braün reported twenty-three cases in which relapses did not occur for more than a year. Among eighty-five successful cases operated by Schroeder, twelve remained well at the end of the third year.

There is no doubt that a radical cure was effected in some cases, while decided palliative effects were produced in others by the relief of the hemorrhage and gangrene. In suitable cases the same results were obtained as by total extirpation and with much less danger to life.

Amputation of the cervix is performed mainly in cancers of the portio vaginalis, which occur generally as papillary cancroids, more rarely as shallow ulcers. As they exhibit a greater tendency to spread peripherally to the fornix than upwards to the supra-vaginal cervix, the healthy tissues may often be excised. Fig. 150 shows a cauliflower growth which proliferated into the vagina from a healthy portion of the portio. Partial extirpation of the uterus will suffice much less frequently in canc of the mucous membrane or walls of the cervix. It is true that the tec nical problem of partial or total excision of the supra-vaginal cervix h been solved by Hegar and Schroeder, but there are very few cases i which we may remain outside of the boundaries of the neoplasm, b means of these operations. Total extirpation is generally indicated i such cases.

Amputation of the cancerous cervix has been repeatedly performed du ing pregnancy. Among eight cases collected by Moericke, abortion w produced only three times.

Very few cases of sarcoma and myxoma of the cervix have been r ported. Gusserow collated five cases of fibro-sarcoma, and three of di fuse sarcoma of the cervix. Spiegelberg and Rein reported cases whic they called sarcoma colli uteri hydropico papillare, and myxoma enchon dromatodes arborescens colli uteri. In the first case total extirpation wa performed at the end of two years, after several useless removals of th proliferations. The second case terminated fatally from opening th peritoneal cavity with the *écraseur*

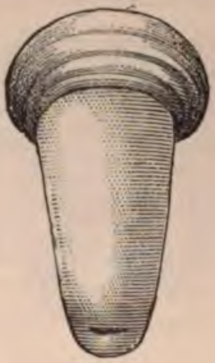

FIG. 151.

Later, amputation of the cervix was performed in the various forms c hypertrophy. Hypertrophy of the portio vaginalis may occur as a uniform teat-shaped elongation (Fig. 151), or as a predominant elongation of on lip of the cervix. In other cases there is circular hypertrophy whic affects chiefly the thickness of the portio. In uterine prolapse the supra vaginal portion of the cervix often shows considerable prolongation Since Huguier called attention to the importance of this anatomical con dition in the genesis and treatment of uterine prolapse, excision of th supra-vaginal cervix plays an important part in the operative treatment of prolapse of the uterus.

Peculiar tumors are sometimes produced, owing to the fact that, in addition to the connective tissue and muscular coat, the follicular and glandular apparatus also takes part in the hyperplastic process and undergoes cystic degeneration. The entire portio or one lip becomes converted into a cucumber-shaped, nodular tumor which fills the vagina, and may even protrude from the introitus (polypoid elongation of the lips of the cervix). This affection is important on account of the often enormous abundance of vessels. It is distinguished from polypi by the fact that its apparent pedicle is formed of the entire width of the lips of the cervix.

Removal of the portio vaginalis is also indicated in chronic inflammatory conditions of the cervical walls or their mucous membrane, inflammations of the follicular apparatus, extensive erosions with glandular proliferation and papillary excrescences. As a rule, the knife is more effective in such cases than the application of caustics. The bleeding often acts favorably on the accompanying chronic metritis, which in itself is considered by some authors as an indication for the operation.

Amputation is also indicated in changes in the shape of the cervix—conical, snout-shaped and trumpet-shape portio—if they give rise to stenosis, stasis of secretion, dysmenorrhœa or sterility. In deep cervical fissures the separated lips should not be amputated unless they present marked changes.

The length of the portion removed depends upon the indication. If the disease is confined to the portio vaginalis, the infra-vaginal portion of the cervix alone need be removed. But if a malignant growth extends further up towards the cervical canal, or if, in prolapse, the elongation or circular hypertrophy extends to the supra-vaginal cervix, the latter must be removed in part or entirely (funnel shaped or total excision of the supra-vaginal cervix.)

The exact differentiation of the cervix and fornix may be difficult in cancer as well as in prolapse. But this is no longer so important as formerly, since we must always remain outside of the boundaries of the diseased part, and, after opening the fornix of the vagina, injury to the bladder and Douglas's sac may be avoided by the direction of the incision. It is mentioned, as a distinguishing feature, that the portio vaginalis is separated from the fornix by a shallow groove, and that it presents certain differences in color. In prolapse, as a rule, the inverted vagina may be shoved along the subjacent cervix; it may be raised into a fold or the cervix within it may be grasped between the fingers and moved to and fro. A sharp boundary is often noticed between the smooth surface of the portio and the rough vaginal walls.

AMPUTATION OF THE INFRA-VAGINAL CERVIX OR PORTIO VAGINALIS.

The usual methods are removal with the knife, and with the galvanocaustic cutting loop. The application of the *écraseur* and ligature of the portio should be avoided.

The advantages of the operation with the knife consist in the fact that we can control the height and shape of the removed part, and can modify the operation when necessary. In malignant growths, erosions or ulcerated surfaces, we can remain exactly at the boundaries of the disease. The cut surfaces can be closed accurately, and union by first intention is always attained with proper technique and antisepsis. Infection and secondary hemorrhage are thus prevented, and the period of recovery appreciably shortened. The hemorrhage constitutes the only objection to the exclusive use of the knife. But apart from the fact that this may be beneficial in some chronic inflammatory processes, we now possess various means of restricting the bleeding or even preventing it entirely.

Preparations for the Operation.—The instruments consist of a bivalve speculum, lateral depressors, volsella, tenacula, straight or curved knives, lancet knives (Schroeder), Cooper's scissors, short curved needles, needle and sponge holders, silk and wire sutures.

The vagina and external genitals are carefully cleaned and disinfected immediately before the operation. Narcosis is not absolutely necessary.

Position.—In prolapse the operation is performed in dorsal decubitus, two assistants keeping the labia separated. Even if the uterus is *in situ* the portio vaginalis, as a rule, may be drawn to or in front of the vulva by means of tenacula or a ligature passed through the part. But the exercise of great force should be avoided, and it is then preferable to operate *in situ*, the vagina being exposed in the lateral or breech-dorsal position. Forcible traction on the uterus is strictly interdicted in inflammatory processes in the ligaments, and especially in dilatation of the tubes.

If the saving of blood is important or the incised surface promises to be very vascular, we may employ prophylactic measures against hemorrhage. A ligature is passed around the supposed point of entrance of the uterine artery from the fornix, or the portio is ligated with an elastic ligature behind short lancet needles passed through crosswise. Kaltenbach effected the same object in a case of polypoid elongation of one lip of the cervix by grasping its entire base in two curved Hegar's push forceps. In the majority of cases such devices are unnecessary.

1. *Removal with the Knife.*

The portio vaginalis was formerly removed, after circumcision of the vaginal insertion, in a straight plane, and the hemorrhage checked by the actual cautery or chloride of iron. Hence, union by first intention could not be obtained, and the retraction of the cicatrix, which is of such importance to the external os, was left entirely to chance. The cautery eschar and the serum of the wound decompose and give rise to sepsis; this may also be followed by considerable hemorrhage from eroded vessels.

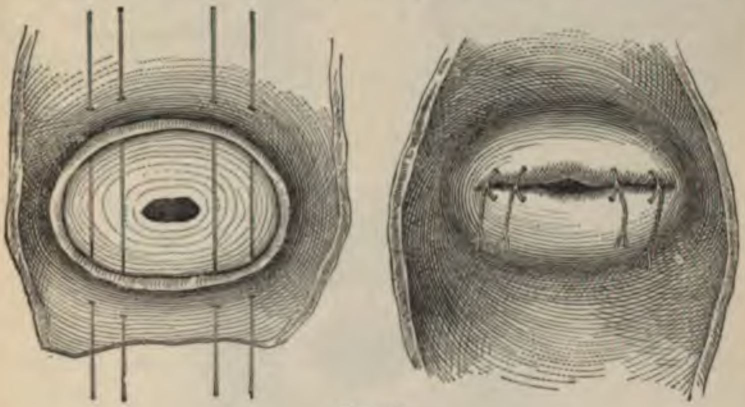

FIG. 152.

All these disadvantages are avoided if the hemorrhage is checked by ligature or the application of sutures to the wound. Sims was the first to employ suture of the wound after amputation of the cervix. He desired to cover the cut surface with vaginal mucous membrane in the same way that the amputation stump of an arm is covered with integument. He passed, on each side of the cervical canal, two silver wires from before backwards through the cut surface of the vagina, and thus covered the stump with mucous membrane in such a way that only a small oval opening remained in the middle. (Fig. 152.) This method, which merely unites vaginal mucous membrane with vaginal mucous membrane, is not very effective, because a cavity remains behind the line of union, within which blood and secretion gather. A marked improvement was made by Hegar, who passed the sutures below the entire base of the incised surface, and then out through the middle of the anterior and posterior cervical walls, in order to bring the cervical mucous membrane in exact contact with that of the vagina. In this way we have great control over the shape of the os uteri. According to the peculiarities of the individual case, the sutures may be applied in a circle (Fig. 153 *b* and *c*), or the vaginal mucous membrane may be stitched to that of the cervix only in the middle, corresponding to the width of the os uteri, which is to be newly formed on both sides, or vaginal wall may be stitched to vaginal wall (Fig. 153 *a*). If

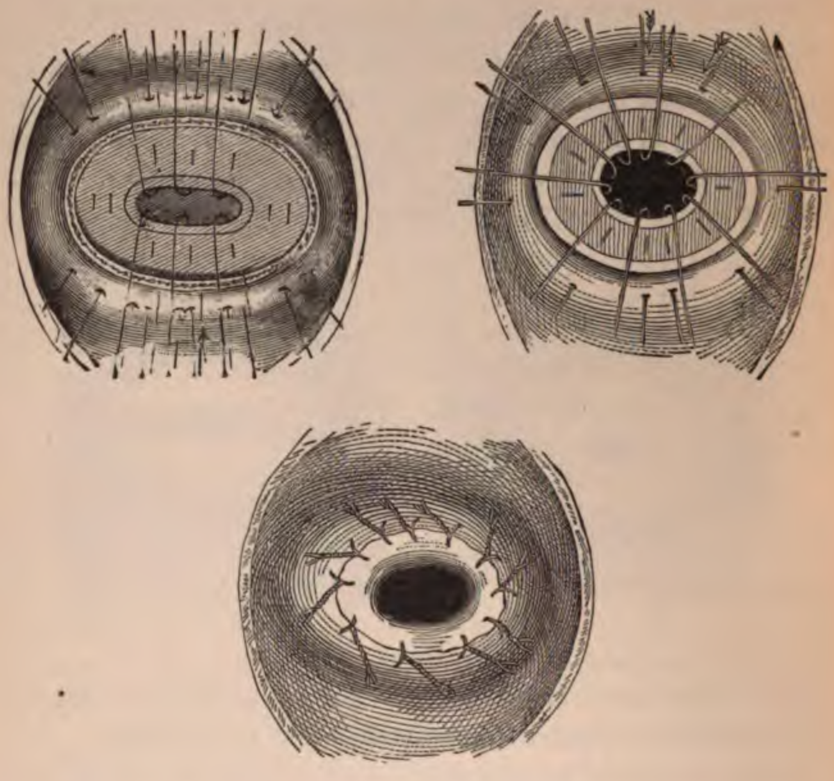

FIG. 153.

the consistence of the cervical walls is normal, this method gives satisfactory plastic results, even if the portio vaginalis is removed in one plane. When the cervical wall is firm and rigid, the excised surface can not always be readily folded in the middle, so that the edges of the wound are brought into linear coaptation. The tissue protrudes between the sutures like a rosary, or the sutures cut through on account of excessive tension of the softer cervical mucosa, especially if a thick layer of the muscular wall is not included in the sutures, as shown in Fig. *a* and *b*.

The shape of the wound becomes more favorable if each lip of the cervix is separately incised transversely in a wedge-shape. Two transverse lobes are thus formed on the anterior and posterior cervical walls, the edges of which fit very accurately into one another, and may be covered with mucous membrane in the region of the os uteri. (*Vide* Fig. 154.)

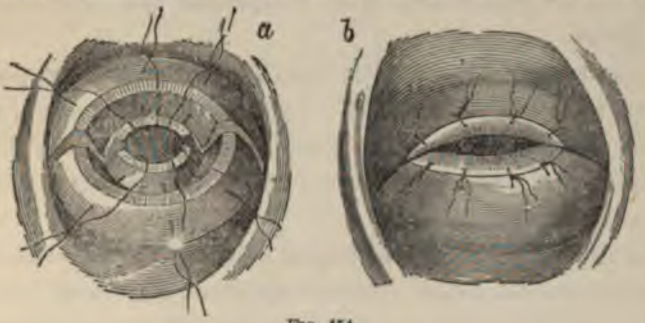

Fig. 154.

This rational method, which may be variously modified according to the object of the operation, is performed in the following way: Both angles of the os as far as the vaginal insertion, are first divided with curved scissors. The lips of the cervix may thus be moved downwards more freely, and can be turned out so that the inner surface of the cervical canal becomes visible. The anterior lip is then drawn forwards with a tenaculum and a wedge-shaped piece is excised in such a way that two transverse sections converging obliquely upwards from the sides of the cervical canal and fornix will meet about at the middle of the anterior cervical wall (Fig. 154 *a*). The anterior and posterior lips arising in this way are joined by sutures. The first suture is applied where a vessel is spirting. The hemorrhage ceases, as a rule, after the first two sutures, but if it continues to an annoying extent, the lateral angles of the incision in the vaginal fornix are grasped temporarily in long push forceps.

About four to ten sutures are necessary, according to the width of the lips. The ends of the wires or threads are left long, so that the uterus may be drawn forwards by their means, while the posterior lip of the os is excised and treated in a corresponding manner. The hemorrhage here is usually greater.

Finally the lateral incisions, which extend into the fornix, are closed by a few sutures; if the hemorrhage is not checked entirely, they should be applied in the form of ligatures directed obliquely upwards, in order to occlude also the vessels which pass down to the portio vaginalis in a longitudinal direction.

During the entire operation the vagina is irrigated with weak disinfectant solutions or frequently touched with stronger disinfectants. Before the sutures are tied the wound surfaces are again carefully disinfected, and then all the accumulated blood is expressed from between the edges of the wound.

The transverse wedge-shaped excision of the lips is always practicable, if the walls are sufficiently thick. But if they are very thin, as occurs in certain errors of shape of the portio, attended with dilatation of the canal, their small size is very apt to interfere with the exact performance of the operation.

When the cervical fissure is very deep, wedge-shaped excision of the lips may be combined with Emmet's operation, the lips of the os being excised only so far as they present changes which extend deeply into the mucosa, and the lateral edges of the fissure being then denuded and stitched together. Kehrer has employed sagittal wedge-shaped excision of the lips, in which the two lateral lobes are finally brought together and united.

In prolapsus, anterior colporrhaphy may be advantageously combined with wedge-shaped excision of the anterior lip.

Schroeder performs a peculiar partial excision in old cervical catarrhs. He excises transverse wedge-shaped pieces, with the base directed towards the cervical canal, from both lips. If the cervix is drawn down very far, marked ectropium of the lips of the os is produced by drawing them apart with tenacula and even by bilateral incisions. With a sharp pointed knife Schroeder then cuts as high as possible, through the mucous membrane of one lip into the cervical tissue, and then, beginning at the lip of the portio and inserting the knife as far as possible, excises the entire inner surface of the lip. The remaining tip of the lip is folded into the cervix and stitched to the upper edge of the wound. The same operation is repeated on the other lip. The largest part of the cervical canal is thus provided with vaginal mucous membrane which presents no tendency to disease (Fig. 155 *a* and *b*).

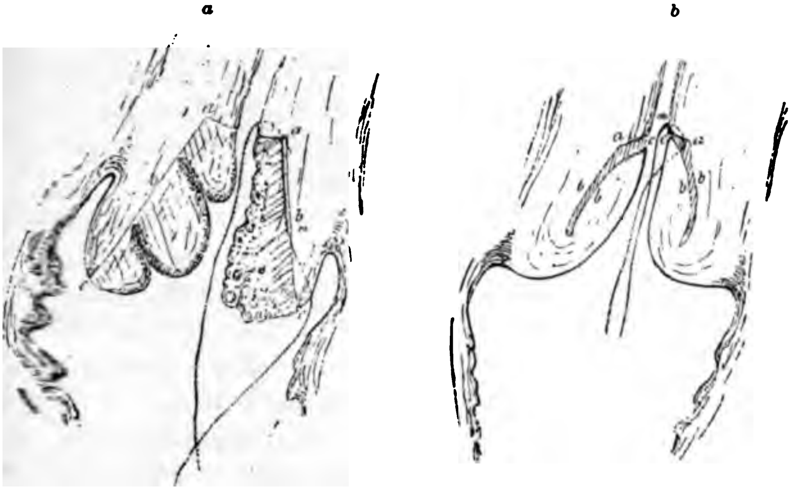

FIG. 155.

Finally, we may refer to the proposition to replace amputation, in intra-vaginal prolongation of the cervix, by annular excision of the mucous membrane covering the portio vaginalis, and uniting the upper and lower edges of the wound (colpocervicoplastik).

2. *Removal with the Cautery Loop.*

In plastic operations intended for the restoration of an os of normal dimensions, the use of the actual cautery is excluded on account of the subsequent retraction of the cicatrix.

In polypoid elongations of the lips of the cervix, the galvano-cautery is insufficient for hæmostasis, on account of the often colossal development of the vessels. In an operation of this kind we observed a dangerous hémorrhage, which was checked with difficulty by a firm vaginal tampon. The galvano-cautery has been employed most frequently for the removal of malignant tumors of the portio vaginalis, special stress being laid on the saving of blood, and the protection against inoculation with cancer juice.

The portio is removed by the cautery loop in a circular surface parallel to the cervical canal. If the loop is applied at the boundary of the fornix, complete removal of diseased tissue is only possible in those rare cases in which the growth is confined to the portio, and, particularly on the side of the cervical mucosa, does not extend beyond the vaginal insertion. If growths which extend higher are to be removed completely, this can only be done by applying the loop above the inverted vagina, the uterus being drawn forcibly downwards.[1] This is very apt to be done, as is proven by the numerous cases in which Douglas's sac was opened. Braün alone removed larger or smaller portions of the peritoneum seven times among his cases of "permanent recovery."

Some authors infer from the shape of the excised surface, that the supra-vaginal cervix is partly accessible to the cautery loop. Spiegelberg and Gruenewaldt state that the central cut surface always appears excavated, *i.e.*, that a cone has been removed. On the other hand, Gruenewaldt recognizes the insufficient action of the cautery, inasmuch as he remarks that the amputation of the degenerated cervix, as a rule, forms only the first stage of the operative procedure. Braün takes the same stand, and recommends the combined use of the knife and cautery loop. Within the cauterized surface he excises, with a knife or Bozeman's fistula scissors, the diseased central portions of the uterine stump, which appear as soft granular masses of a whitish yellow color against the brownish firm tissue of the cauterized, healthy muscular coat.

Hence, the cautery loop is confined to a very narrow class of cases.

In addition to these objections there are also certain other disadvantages connected with its frequent use. In the first place the method is very complicated, and sometimes even unreliable. It is quite difficult to imbed the loop in the proper position; the wire not infrequently tears or cautery heat is not produced, so that recourse must finally be had to the knife or scissors.

Nor may we overestimate the advantage of the saving of blood, which is undeniable in many cases. In the first place provisional hæmostasis may often be secured in operations with the knife, and on the other hand, the hæmostatic action of the cautery loop upon larger arteries is by no means certain. Gruenewaldt observed a rapidly fatal hemorrhage from an abnormally distributed branch of the hypogastric artery. In other cases the mere application of the loop destroys vascular papillary tumor masses, or the advantage arising from the primary saving of blood is lost as the result of secondary hemorrhages.

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[1] Freund has introduced curved needles cross-wise through the supra-vaginal cervix, prior to the galvano-caustic amputation. These not alone furnished a firm support to the loop which was placed above them, but, on account of their great curvature, made conical excision of the cervix possible. But the loop would be very apt to tear when it comes in contact with the metallic needles.

It is by no means unimportant that we must abandon the expectation of union by first intention. It is not easy to keep the eschar aseptic. Profuse suppuration usually sets in from the fifth to tenth days, delays recovery, and may even be the starting-point of infection. The subsequent retraction of the cicatrix often gives rise to stenosis, and even atresia of the cervical canal, or the cervical stump becomes adherent to the fornix of the vagina. In ten cases of recovery Braün observed the subsequent development of an hæmatometra. In one case it returned four times in nine years.

Technique of Galvano-caustic Amputation.—Spiegelberg, as a rule, used the large Middeldorpf battery of four elements. According to the depth at which the operation is performed, the loop is placed in a short straight or longer curved loop-carrier, and is applied with the fingers or with special, crutch-shaped guides to the exposed portio, shoving them over the forceps used for fixation. Not until the loop is placed in position is the loop-carrier connected with the conducting wires. The loop is first made rapidly smaller, in order to imbed it at the point of removal. Further constriction must be performed slowly for the sake of hæmostasis. The strength of the current should not be too great, or the platinum wire will become excessively hot, and is apt to tear. If the patient complains of the intense heat, the vagina may be irrigated from time to time without interrupting the current.

The Pacquelin thermo-cautery has been employed a good deal in recent times. It possesses the advantage over the cautery loop, that a portion of the supra-vaginal cervix may be reached by an oblique incision. In other respects it is similar to the galvano-cautery. It often prevents bleeding and guards against inoculation of the growth in healthy tissues, and may even destroy cancer elements situated beyond the plane of removal. On the other hand the direction of the incision is very little under our control and we are unable to recognize the boundaries of the new growth beneath the eschars. In addition the field of operation is often obscured by the smoke which accumulates in the vagina.

We are utterly opposed to the use of the *écraséur*. In addition to the objections to the cautery there is great danger of injury to adjacent parts. In no other method has opening of the bladder, ureters or Douglas's sac been observed with such frequency. Such injuries are usually owing to the fact that, the uterus having been pulled strongly downwards, the loop of the *écraseur* has been placed above the inverted vagina, instead of the boundary of the fornix, and hence the bladder and peritoneum have been included in the loop. Injuries may also result from the fact that the brittle muscular wall of the cervix yields earlier than the tough vagina. The latter is then drawn deeply into the groove of constriction and is separated from the underlying layers of tissue, after rupture of adjacent hollow viscera.

EXCISION OF THE SUPRA-VAGINAL CERVIX.

Extirpation of the supra-vaginal cervix can only be done with cutting instruments.

The first method of excision of the elongated supra-vaginal cervix in prolapse was devised by Huguier and called conoid amputation. The following are the main features of this method. Semi-lunar transverse incision through the insertion of the vagina at the posterior lip of the os, followed by oblique division of the muscular wall of the cervix in an upward direction. Then opening of anterior vaginal fornix, 1 cm. below the deepest part of the bladder, as shown by the catheter. Separation of the anterior uterine wall from the bladder and oblique funnel-shaped excision of the anterior and lateral cervical walls upwards and inwards. Separation of the remaining central portion of the cervix with the *écraseur*. Hæmostasis by ligature, acupressure with curved needles, tampon of cotton dusted with colophonium, application of ferric chloride. In this way Huguier removed pieces 3½ to 4½ cm. in length.

Hegar's funnel-shaped excision is an essentially different operation, and is employed not alone in simple elongation but also in cancer of the supra-vaginal cervix. The fornix and parametrium are not opened, and the wound surface is closed with sutures. The portio vaginalis, which is drawn down with Museux's tenacula or ligatures, is circumcised below the vaginal insertion. From this incision (3 to 4 mm. in depth) the knife is passed, at first anteriorly, then obliquely upwards and inwards towards the cervical canal. In order to estimate the thickness of that part of the wall which has not been divided, a sound or the finger is introduced from time to time into the gaping cervical canal, and the attempt made to grasp the anterior wall of the cervix between the index finger and thumb. If the cervical canal has been opened anteriorly and the hemorrhage is considerable, a suture is introduced forthwith beneath the entire wound surface of the cervix, including the cervical mucosa. This serves as a convenient guide rope for the uterus, and facilitates the introduction of subsequent sutures. If there is no notable hemorrhage, the funnel-shaped excision is continued from the sides and behind. The excised portion is shaped like a cone or inverted funnel, whose length (from the vaginal insertion) may be 3 to 4 cm. (Fig. 156). Union of the wound surface is difficult on account of the firm connections and the greater distance of the cervical mucosa from the edge of the fornix, but it is by no means impracticable. The sutures are generally applied circularly, and it is only in exceptional cases that vaginal fornix is united to vaginal fornix at the sides. Short curved needles or nearly straight needles, with handles, are employed, and are passed beneath the entire raw surface. This is greatly facilitated by drawing down the cervical mucosa with fine tenacula. Union by first intention may be secured wholly or in great part, inasmuch as only a few sutures cut through the brittle cervical mucosa.

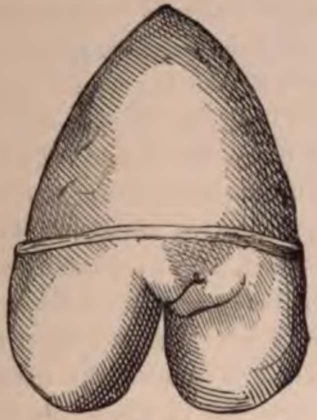

FIG. 156.

Martin devised a peculiar method of sutures after funnel-shaped excision of the cervix. At the anterior wall of the supra-vaginal raw surface a needle is introduced transversely below the surface in such a manner that it includes a portion which slightly exceeds the width of the cervical canal. Closure of this suture produces a fold in the long axis of the cervix, and extending upwards into the cervical canal. A second needle is inserted ½ cm. to the outside of the median line of the vaginal mucous membrane, passed below the anterior wound surface to the vicinity of the first suture, drawn out below the left side of the previously formed fold, again inserted in the fold of the other side, and then withdrawn on the right side about ½ cm. from the median line of the vaginal mucous membrane. When this suture is tied toward the vagina, the edge of the vaginal mucous membrane is drawn widely towards the cervical canal, and a ridge is produced which corresponds to the anterior lip. The same procedure is then repeated at the posterior wound surface. The lateral portions of the supra-vaginal wound are united in the old manner by sagittal sutures.

Schroeder recommends a method of total excision of the cancerous cervix, in which the vaginal fornix is intentionally opened. The entire thickness of the cervix is separated from surrounding parts, and the extirpation may even be continued beyond the internal os. This plan is also applicable if the neoplasm has extended to the fornix.

On both sides of the portio and at some distance from the growth, a strongly curved needle is inserted into the anterior fornix, and after passing around the parametrium, is withdrawn in the posterior fornix. When both sutures are tied, the fornix and uterus can be drawn down conveniently; moreover, they surround the lower branches of the uterine artery and serve as deep sutures after excision of the cervix is completed. The diseased portio, which is steadied with tenacula, now receives a circular incision ½ to 1 cm. outside of the neoplasm, and after cutting the thick vaginal wall, the cervix is separated from surrounding parts with the finger and handle of the scalpel. Firm bands of tissue and vessels are cut with the knife. If the peritoneum of Douglas's sac has been injured, the rent is stitched forthwith with catgut or fine silk. When the cervix has been freed to such an extent that an incision may be made with safety above the diseased parts, the cervix is cut through with a pointed double cutting knife, at first anteriorly, then posteriorly, in the direction of the internal os. The hemorrhage which, "as a rule, is not excessive," is checked by about a dozen sutures which include the remaining edge of the anterior fornix, then a part of the uterine stump, and are withdrawn through the posterior fornix. Some of the sutures should be introduced deeply in order to prevent the formation of large hæmatomata between the united vaginal mucous membrane and uterine stump.

Schroeder has recently attempted to secure greater certainty against relapses by a combination of high amputation with the vigorous use of the actual cautery. In order to control the hemorrhage as much as possible, the parametrium, before being opened, is constricted with loops of thin wire. After it is exposed on all sides the cervix is incised high up on both sides,and then one half of the cervix is amputated. Then a series of wire loops are drawn through the corresponding fornix and the stump towards the cervical canal. These will serve, on the subsequent application of the actual cautery, to draw the uterus downwards and steady it. If there is considerable hemorrhage, the wire may be tied forthwith, otherwise it may be left untied until after the cauterization. After the other part of the cervix has been treated in the same way, the actual cautery is applied vigorously to the stump and the entire wound, and, finally, all the wire loops are tied. Fatal secondary hemorrhage occurred in one case of very high amputation, in which the wires were tied before cauterization, and were probably loosened by the latter manipulation.

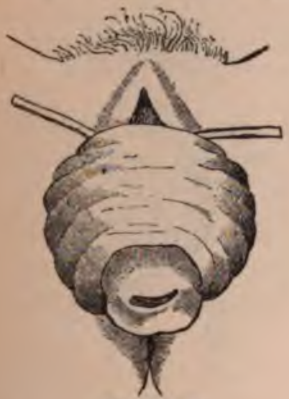

FIG. 157, *a*.

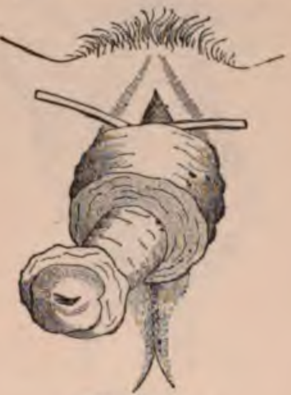

FIG. 157, *b*.

Since 1879 Kaltenbach has combined, in large prolapses, total excision of the cervix with partial resection of the vaginal fornix. After emptying the bladder, and pushing away any loops of intestines which may be situated in Douglas's sac, the entire prolapse is constricted by an elastic ligature immediately in front of the introitus (Fig. 157 *a*). If this cannot be done on account of the conical shape of the prolapse, parametral sutures are introduced 3 to 4 cm. above the apex of the prolapse, and which, extending to the lateral border of the cervix, grasp the uterine arteries securely. Then the vaginal insertion is incised, ulcerated surfaces on the portio or in the fornix being included, if possible, in the incision. From this circular incision, which is very wide if the lips of the cervix are very thick or inverted, incisions are made, converging strongly inwards and upwards towards the supra-vaginal cervix, which is usually quite slender above the vaginal insertion. The supra-vaginal cervix can usually be enucleated easily from the surrounding loose cellular tissue by the aid of the knife and scissors, and partly by blunt instruments and traction. (Fig. 157 *b*.) After this has been effected to the proper distance (if necessary, even beyond the internal os), the enucleated cervix is divided with a pair of scissors, which have been introduced into the cervical canal, into an anterior and posterior half (Fig 157 *c*), and then each cervical wall is removed separately, small semi-lunar lobes being retained (Fig. 157 *d* and *e*). The latter are then united to the edges of the vaginal wound by four to five deep sutures, which are inserted anteriorly and posteriorly in the middle of the large supra-vaginal raw surface. It is not advisable to continue meridional sutures laterally over the stump, inasmuch as very severe hemorrhage is then apt to occur, after removal of the elastic ligatures, from the vessels which run parallel to the sutures and which have not been occluded. Complete hæmostasis can only be effected by transverse ligature of the large vascular plexus which descends along the lateral border of the uterus. Simple ligatures *en masse* are unsuitable; they include too much tissue and are thus apt to give rise to necrosis. Kaltenbach therefore excises from the inverted vagina, on both sides, triangular flaps whose base is directed towards the opened vaginal fornix (Fig. 157 *e*), and closes these wounds, which expose the parametral cellular tissue with the main branches of the uterine artery, with a few deep

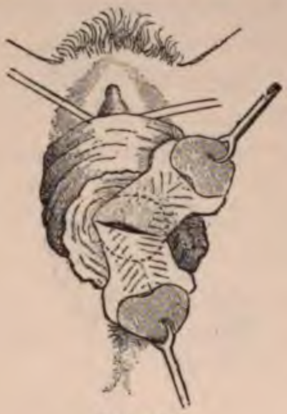

FIG. 157, *c*.

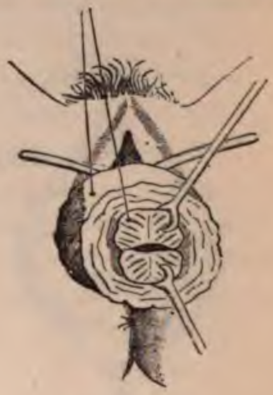

FIG. 157, *d*.

silk sutures. Fig. 157 *f* illustrates the appearances after the sutures are applied.

This excision of the flaps from the vaginal fornix is very important for checking the hemorrhage completely. By diminishing the elastic resistance of the tissues it facilitates the firm tying of the ligatures, so that further ligatures are hardly necessary after removal of the constricting rubber tube. It is also useful for plastic purposes, inasmuch as it produces concentric narrowing of the fornix, and thus antagonizes its primary inversion.

The cervix excised according to this method looks like an inverted mushroom, whose roof is formed by the disc-shaped circumcised portio.

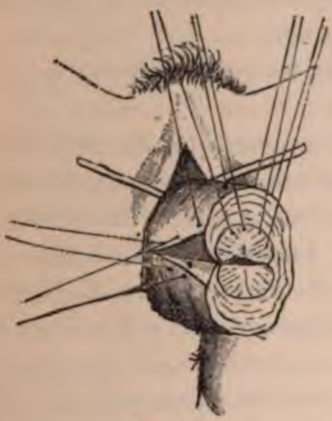

FIG. 157, *e*.

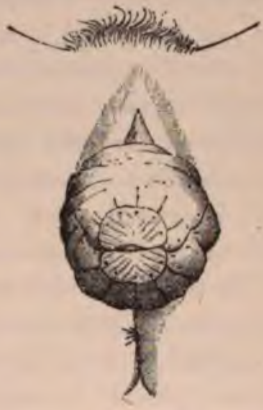

FIG. 157, *f*.

Kaltenbach has employed this method twenty-six times as a preliminary to kolpoperineorhaphy, or as a supplement to it in those cases in which the length of the uterus reached 12 cm. or more. The excised portion was usually 5 to 6 cm., occasionally even 7 cm. long. The plastic results were always very satisfactory. In one case this operation alone secured retention of the prolapse, and the symptoms, which were produced by traction on the bladder, ceased.

AFTER-TREATMENT.—DANGERS OF AMPUTATION OF THE CERVIX.

At the close of the operation the vagina is washed with corrosive sublimate (1:1000) and an iodoform tampon is inserted. After the eighth day the sutures are removed, under strict antiseptic precautions, in the lateral position. Vaginal irrigations are entirely superfluous when convalescence runs an apyrexial course. Secondary hemorrhages are checked by injections of hot water, the tampon or fresh ligation.

But hemorrhages and febrile wound diseases can almost always be avoided in amputation of the infra-vaginal cervix. Even when the actual cautery is employed, the eschar may be kept aseptic by the use of corrosive sublimate and iodoform. Accidental injuries will not be produced unless, when the uterus is drawn forcibly downwards, the boundaries of the vaginal insertion are not recognized, and separation with the knife, actual cautery or *écraseur* is performed within the inverted vagina. Death from shock, as has been reported by Lisfranc, Simpson, etc., was generally the result of improper methods of operation or accidental injuries. In Spiegelberg's case, for example, air and blood entered the torn posterior peritoneal fossa. After temporary recovery the patient succumbed to a secondary hemorrhage.

Excision of the supra-vaginal cervix is a much more serious operation. Injuries to the peritoneum, bladder or ureters are very apt to occur, especially in cases of cancer. Small incisions or rents of the peritoneum or bladder are sewed at once, and do not interrupt the course of the operation. In quite extensive openings into the peritoneum K. Braün contented himself with a moderate abdominal compress and bandage, which was supposed to favor the coaptation and adhesion of the edges of the peritoneal wound. In very extensive and irregular rents total extirpation of the uterus may come into question for the purpose of producing simpler conditions in the wound. The peritoneum was sometimes supposed to have been injured, because, after the fornix was opened, there appeared in the tissues sharp-bordered openings, through which the loose parametral cellular tissue or the peritoneum appeared as a bluish sac. The real condition is recognized at once on the introduction of a surgical sound.

In excision of the supra-vaginal cervix the hemorrhage is apt to become dangerous if we are unable to occlude the vessels prophylactically by elastic ligatures or sutures. Secondary hemorrhages have repeatedly proved fatal.

Infectious surgical diseases are also prevented with much greater difficulty. Fever often results from insufficient disinfection and improper application of sutures. The latter may not have been passed to a sufficient depth below the base of the wound. Cavities remained behind the line of coaptation, within which the blood and wound secretion decomposed. If the retained masses do not soon rupture spontaneously, or an opening is not formed by partial removal of the sutures, circumscribed inflammatory processes develop in the parametrium and peritoneum, together with infection and destruction of thrombi in the vessels. The patients may die of the general infection or putrid poisoning.

Such unfavorable complications have become much less frequent since the recent improvements in the method of operation and in antisepis. Thus Kaltenbach observed fever repeatedly in his first total excisions in prolapse, and in two cases perimetritic exudations developed. Later, union by first intention occurred in every case and was unattended with fever.

Tetanus is a rare cause of death after amputation of the cervix. Schroeder observed it once after amputation of a cancerous portio and the application of the actual cautery and liquor ferri, and also after a funnel-shaped excision in a colossal hypertrophic portio; Kaltenbach observed it once after total excision of the cervix in prolapse.

Statistics of the mortality and morbidity do not possess much value, because it is difficult to separate the methods of operation and the indications. But it is at least evident that the general results have improved, and that much better success is obtained with the knife than with the cautery. Finally, amputations for plastic purposes are much less dangerous than carcinoma operations. This is especially evident in total excision of the cervix. Among fifty-two supra-vaginal excisions for cancer Schroeder lost five; among twenty-six total excisions for prolapse performed by Kaltenbach, only one terminated fatally (from tetanus).

ENUCLEATION OF INTRA-MURAL AND SUB-MUCOUS TUMORS OF THE UTERUS THROUGH THE VAGINA.

HISTORY OF ENUCLEATION.

Dupuytren and Velpeau seem to have been the first who expressed themselves definitely in favor of the enucleation of these tumors through the natural passages.

In 1840 the first operation was performed by Amussat. Among three cases, he had two recoveries and one death. Velpeau attempted the operation twice but was able to complete only one; both patients died. Demarcquay operated four times with one favorable result. The operation was performed much more frequently in England and America, particularly on the recommendation of Atlee. In 1857 Hutchinson collated eighteen complete and six incomplete operations, one-third of which terminated fatally. Routh added nine cases with eight recoveries. In Germany Langenbeck first performed the operation successfully in a number of cases. In 1878 Gusserow collated 154 enucleations with 33.1 per cent. mortality, including fifteen incomplete operations with nine deaths. In twenty-nine cases, the operation was performed at different intervals; six of these cases terminated fatally. Among nineteen enucleations by Hegar and Kaltenbach prior to 1881, four ran a fatal course; Kaltenbach's five subsequent cases in Giessen recovered. Lomer collected 130 operations performed between 1873 and 1883 (after the introduction of antisepsis) with eighteen deaths (16 per cent.).

The statistics at our command furnish an insufficient basis for our judgment. They enable us merely to recognize that the operation formerly was hardly less dangerous than laparotomy, and that it was impossible, in very many cases, to arrive at any positive conclusion with regard to the practicability of the operation. They admonish us to exercise great caution in the selection of cases, without enabling us to determine the exact boundaries of enucleation as compared with myomotomy and castration. Nor do they permit a just conclusion with regard to the present greatly diminished danger of the operation.

ANATOMICAL CONDITIONS AND INDICATIONS.

Uterine tumors cannot be enucleated through the natural passages unless they are imbedded loosely in the wall of the uterus, project strongly towards the interior, but are covered externally by an intact muscular layer; at the same time they must be easily accessible through the vagina and cervical canal. As a general thing these conditions obtain in broad-based, sub-mucous myomata, and in those interstitial forms which have grown chiefly towards the mucosa, where they are only covered by a thin layer of muscle. The more sharply the tumor is defined against the surrounding muscular walls, the more readily may it be enucleated from its capsule-like bed, after cutting through its covering-layers of mucous membrane and muscle. The connection with the surrounding uterine wall is effected almost exclusively by threads and plates of cellular tissue, within which run a few vessels of small calibre. It is only where thicker bands of muscle enter the tumor that the connection with surrounding parts becomes firmer and the tumor receives larger vessels. The mucous membrane capsule covering the tumor internally is especially rich in vessels, and its dilated vessels form the chief source of the hemorrhages.

The majority of the myomata in question are simple; lobulated tumors formed of several nodules can rarely be enucleated smoothly. They are situated most frequently in the fundus and body of the uterus. Their insertion may be confined to the anterior or posterior wall of the organ, but they sometimes extend over the anterior and posterior wall and fundus, or from one side of the cervix to the opposite side of the fundus.

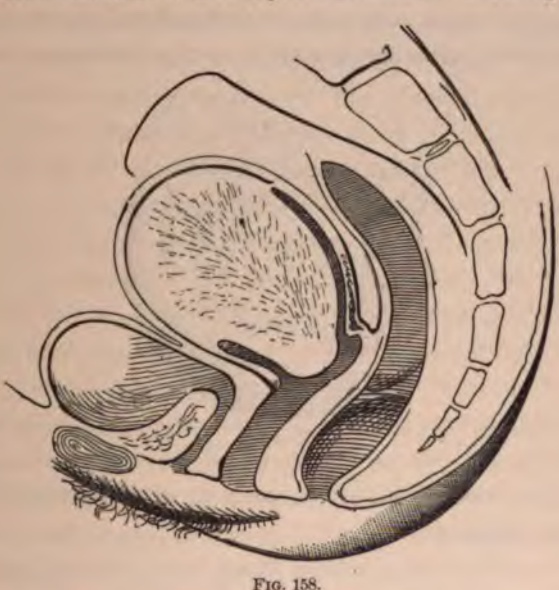

FIG. 158.

At first the tumors project into the uterine cavity as flat elevations, but they gradually project more steeply and finally hang down below their base. Partly in consequence of the direction of growth, partly in consequence of uterine contractions, they pass, like polypi, through the internal os, dilate the cervix, and finally, may even project in front of the external os (Fig. 158). The lower rounded segment of the tumor is then apt to be mistaken for a polypus. It is distinguished, apart from the immobility of the tumor, by examination with the finger and sound, which reveals its broad insertion. Inversion is excluded by the enlargement of the uterus and the intact shape of the fundus, as shown on bi-manual exploration.

Interstitial and broad-based sub-mucous myomata within the lips of the os, or in the supra-vaginal cervix, are much rarer. The former hardly ever attain a large size. The latter first distend the anterior or posterior wall of the cervix to the maximum, the opposite wall being thinned at the same time, and the transverse section of the cervical canal being distorted into a semi-lunar shape. In their further growth they descend into the infra-vaginal cervix, after partial eversion of the cervical mucosa, but often do not project through the os on account of the excessive size of the supra-vaginal segment.

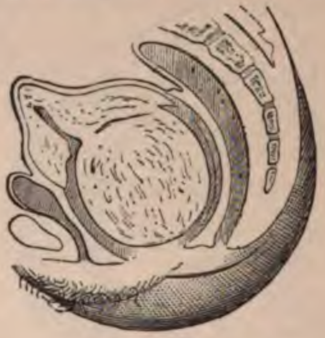

FIG. 159.

Peculiar conditions obtain when broad-based cervical myomata, after extreme distension of the cervical canals, push apart the cervical walls almost at a right angle to the body of the uterus, and project into the vagina, as large spherical tumors, with a somewhat constricted base (Fig. 159). These tumors are easily mistaken for broad-based tumors of the vagina, as the extremely narrow rim of the os behind them is often recognized with difficulty. Characteristic of the majority of these broad-based cervical myomata is their remarkably firm connection with the uterine muscular tissue, from which there is often no trace of separation. It seems as if this very condition prevents the formation of a pedicle. Secondary adhesions to the opposite wall of the cervical canal, the lips of the os or the vagina, have been repeatedly observed in intra-vaginal and intra-uterine tumors which project strongly above their base.

In rare cases sarcomata (relapsing myomata, recurrent fibroids of some authors) are also found imbedded in the uterus. They may possess a perfectly healthy capsule. It may also be mentioned that Hegar enucleated a sub-mucous myoma, on the mucous membrane side of which a carcinoma had developed after perforation of the capsule.

Indications.—Enucleation must be confined to those cases in which it is expected that the operation may be completed. Its interruption is very dangerous, because the remainder of the tumor, which has been separated partly from its bed, is very apt to undergo decomposition.

Very large tumors are excluded from the operation. All our fatal cases occurred in myomata which extended to the umbilicus. The fingers and instruments cannot manipulate freely in the uterine cavity in such cases. Even after partial destruction of the tumor, its removal may be rendered extremely difficult on account of the resistance offered to higher intact portions of the tumor by the uterine walls or the pelvis. If the operation remains incomplete, the danger of sepsis and putrid intoxication increases with the greater extent of the injured uterine cavity. In large tumors, moreover, the uterine walls are generally thin and form a flabby bag hardly capable of contractions, which bleeds strongly and is easily inverted.

Tumors which have no capsule or are separated imperfectly from the surrounding uterine tissues, and approach too closely to the peritoneum, and multiple myomata, are also not adapted for enucleation. Unfortunately we are often unable to recognize with certainty, prior to the operation, the manner in which the tumor is imbedded.

The most important contra-indication is a long, rigid cervix, especially in virginal genitalia. Accessibility to the tumor can then be attained only by prolonged dilatation of the cervical canal, and this is very apt to give rise to infectious processes.

From this standpoint, accordingly, the only tumors adapted to enucleation are cervical myomata and the solitary loosely-imbedded tumors of the body of the uterus, which project strongly internally, shorten and dilate the cervix, and are covered externally by a thick intact layer of muscle. The latter may be inferred from the uniform enlargement and protrusion of the uterus, and the absence of hump-shaped projections or secondary nodules, on its outer surface.

Under such conditions constant hemorrhages constitute the main indication for removal. Other sequelæ, such as symptoms of dysmenorrhœa and traction, sterility, compression of the pelvic organs, form subordinate indications. The operation has been repeatedly rendered necessary because the tumor formed an obstacle to delivery. Formerly the method of operation in such cases consisted of ligature and excision, but recently the tumors have been enucleated from the lips of the cervix with blunt instruments after incision of the capsule.

Gangrene of a myoma, whether spontaneous or after therapeutic procedures, constitutes a further absolute indication. This purposes the shortening of a spontaneous process of elimination, in order to prevent sepsis and further vital losses. In such cases the enucleation is not very difficult, because the depressed tumor presents a convenient point of attack for the instruments, and its connections with surrounding parts have been loosened by the dissecting suppuration and gangrene. Under such circumstances even very large tumors are easily enucleated.

TECHNIQUE OF ENUCLEATION.

Preparation for the Operation.—The sure performance of the operation requires a permeability of the cervical canal for at least two fingers for myomata of the body of the uterus. If this degree of dilatation is not present, it must be produced by artificial means. But the use of tents need hardly be considered, inasmuch as cases in which the tumor has not spontaneously dilated and shortened the cervix to a considerable extent, are not adapted to enucleation.

It is more often necessary to divide, with the knife or scissors, the tense edges of the os, if this alone offers resistance, after the cavity of the cervix is dilated. The canal is also dilated to a marked degree by the course of the operation itself.

The patient is placed in a lithotomy position upon an operating table which is not too low. The breech-dorsal position offers great advantages if the tumor arises high up, especially from the anterior uterine wall. The enucleation of small cervical myomata, which do not require control through the abdominal walls, may be performed in lateral decubitus, with complete exposure of the field of operation. If the starting-point of the tumor is higher up, the exposure of the vagina is only advantageous during incision of the capsule, and the passage of the tumor through the os uteri. So long as our fingers are engaged in the uterine cavity, bivalve specula would only act as a source of disturbance. Full view of the field of operation is obtained in many cases by drawing the uterus gradually to the introitus by means of tenacula inserted in the lips of the os.

Narcosis is necessary, not alone on account of the painfulness of the operation, but also in order to prevent the disturbing action of the abdominal muscles. Disinfection of the field of operation is performed in the usual way before and during the operation.

Performance of the Operation.—When the tumor is intact, the first stage of the operation consists in splitting the capsule. If the tumor projects towards the uterine cavity as a smooth elevation, a longitudinal incision, as long as possible, is made across it with a long-handled knife, which is rounded in front.[1] But if the tumor, which extends beyonds its base, projects into the cervical canal or vagina, as the segment of a sphere, the capsule is opened transversely in the groove between the tumor and the uterus; in this way free access to the base of the myoma is gained at once. The tumor, which projects from its bed, is grasped with Museux's forceps or sharp hooks, and drawn down as far as possible, while an attempt is made to separate it on the sides and towards the base from the uterine wall. If the tumor is sharply defined and loosely imbedded in the uterus, the enucleation may be performed with the fingers, and if these prove inadequate, good services are rendered by blunt spoons, moderately bent spatulæ or scissors, which are blunt anteriorly.

When the connections of the tumor are firm, the operation becomes very difficult. The muscular connecting bands and the adherent portions of the capsule must then be cut with curved scissors under the guidance of the finger.

During the entire operation an assistant steadies the uterus through the abdominal walls, and presses it into the pelvis. At the same time the assistant carefully follows the course of the operation on the inner surface of the uterus, controls the thickness of the intervening walls, and make himself felt to the operator. From time to time the latter also ascertains his position anew by grasping the fundus.

The further the enucleation of the tumor progresses the better does it follow the traction of forceps; the latter must be applied higher and higher, to secure a firmer point of support and prevent tearing within the tumor. But our object is rarely attained by continued traction alone; when the tumor connections are firm and extensive, forced traction is dangerous, because it is apt to produce rupture of the uterine walls or inversion of the bed of the tumor.

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[1] Hutchinson employed the cautery iron, C. Braun the cautery knife. Meadows excised larger pieces of the capsule.

Small myomata may be removed intact. As a rule, large tumors meet with an obstruction at the os uteri or at the level of higher segments of the tumor, which cannot be enucleated on account of the impossibility of passing the fingers and instruments sufficiently far into the uterus.

Room must then be made by removing pieces of those portions of the tumor already separated or by elongating the tumor by making incisions on opposite sides. The latter plan is preferable because we do not lose our hold on the tumor, and can withdraw it as a whole by applying the forceps at successively higher localities. Museux's forceps do not secure a firm hold upon the diminishing tumor, and it is better to replace them by fenestrated forceps with serrated blades (Fig. 160), or by Greenhalgh's instrument, whose blades are movable (Fig. 161). Frankenhauser has devised instruments which are similar to the cephalotribe. At this stage of the operation the exposure of the os is often advantageous because the forceps may then be applied to higher and more resisting parts of the tumor under the control of the eye.

The difficulty of grasping the largest possible pieces of the tumor within the uterus, and the endeavor to guard the fingers from injury by sharp hooks, has led to the invention of various instruments. Martin devised a sort of obstetric forceps upon whose blunt blades short, strong hooks may be protruded after the instrument is *in situ*. Thomas recommends, for the removal of broad-based myomata, a sharp spoon with serrated edges, whose external uterine surface is strongly convex, while the serrations are arranged in such a way that the uterine wall is wounded with difficulty.

C. Braun employed the cranioclast for crushing large tumors. Conglomerated myomata can sometimes be diminished in size very considerably by successive enucleation of the individual nodules, and cystic tumors by opening the cystic cavities.

Calcified tumors with a hard capsule or central calcareous tissue must be broken with strong forceps or bored with sharp spoons and files.

When the tumor presents firm connections and extensive insertion the operation is extremely fatiguing, and the operator may then be relieved from time to time by a skillful assistant. As the operation often lasts for hours, the fingers become paralyzed and lose their delicate sensibility, especially if they are often contused by the instruments employed. After the crushing of the tumor has begun, it is often difficult to find our way between the shreds of the capsule and tumor; the fingers are apt to bore their way outside of the capsule or even through the uterine tissue.

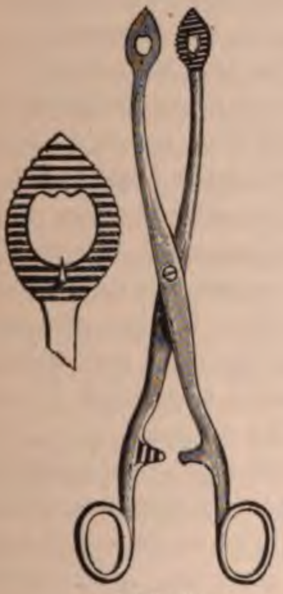

Fig. 160.

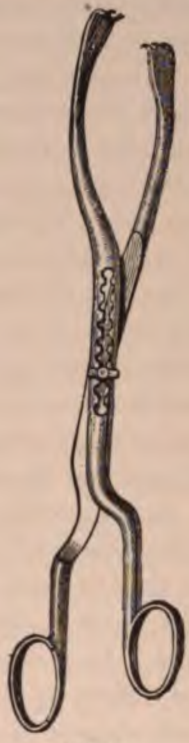

Fig. 161.

Despite the careful selection of cases, it was not infrequently necessary to discontinue the operation, because the operator's energy was paralyzed or the tumor could not be defined at a certain point. The separated parts were then removed and the remainder left to spontaneous elimination, or a second attempt made at the end of a few days, when the necrotic tumor had descended farther, and its connections were loosened by dissecting suppuration. As the second operation was often remarkably easy under such circumstances, some physicians have recommended that the operation be performed at two different periods. But the danger of sepsis is then so great as to more than counterbalance the advantage of the easier performance of the operation. The performance of enucleation in several sittings can only be regarded as a *dernier ressort.* It seems more rational to perform the operation in such a way that the capsule is split in one sitting, and later the enucleation of the intact tumor, which has descended on account of uterine contractions, is undertaken. As the tumor then remains connected with its base almost *in toto*, decomposition often remains absent if the vagina is properly disinfected.

Less difficulty is experienced in the enucleation of gangrenous tumors, or those undergoing spontaneous elimination. The degenerating masses sometimes project far into the vagina. The boundary between the tumor and wall of the uterus is very distinct, and the connection between the two is very loose. In the beginning we should avoid pulling too strongly on the tumor before it has been released sufficiently from its bed. Sharp instruments are very apt to tear through the softened tumor masses, and it is better to employ polypus forceps or fenestrated forceps (Fig. 160). When the myomata are softened Walter recommends the introduction of the half hand and the removal of the tumor in pieces without instruments. As the necrosis generally affects the lower part of the tumor chiefly, the forceps will often find a secure hold deeper in, where the tumor is intact or degeneration is not so far advanced.

Small myomata in the lips of the cervix may be enucleated like sebaceous cysts. After incision of the capsule, they sometimes spring out of their bed. Myomata imbedded higher in the cervix sometimes meet an insuperable obstacle at the tense edges of the os. After enucleation of a myoma, as large as a goose egg, from the posterior cervical wall, Kaltenbach was compelled to incise both sides of the os as far as the vaginal insertion, in order to permit the descent of the tumor. These incisions were stitched at once.

In large cervical myomata with a pedicle-like base (Fig. 159), an attempt is first made to pass into the angle between the tumor and cervical wall by a transverse incision. If such tumors fill the entire vagina or even descend to the introitus, they must be elongated, if it is only to spare the perineum. Forcible traction must be strictly avoided, since this has resulted repeatedly in rupture of the fornix of the vagina, or the posterior cervical wall. We are also opposed to the removal of the extensive base of the tumor with the *écraseur* or cautery loop. The resistance is generally so great that these instruments fail to act or tear. Some of these intra-vaginal myomata are so firmly connected with the uterine walls that there can be no question of their complete enucleation or excision. But success is obtained occasionally by simple amputation of the pelvic segment of the tumor. The hemorrhages and symptoms of compression subside. The surface of removal cicatrizes and the remainder of the tumor shrinks, after previous suppuration. A large coherent part of the remainder of the tumor may be exfoliated with or without marked gangrene. In other cases fatal sepsis sets in. Kaltenbach also was compelled to be satisfied with the removal of the lower segment of a colossal tumor which extended into the epigastrium. This was followed by improvement and gradual diminution of the uterus to the level of the umbilicus. Two months later a portion as large as a fist, which had again descended into the vagina, was removed. This time gangrene of the remainder of the tumor could not be prevented, and the extremely anæmic patient died four weeks later of septic peritonitis.

When the tumor is moderately large and loosely imbedded, the hemorrhage during enucleation is not excessive; it becomes dangerous on account of its long duration rather than its immediate severity. In exceptional cases the hemorrhage during incision of a very vascular capsule or of muscular connecting bands, or during excision of the tumor or injury to the uterine walls, becomes so severe as to compel the discontinuance of the operation and immediate tamponing of the uterine cavity. But the operation should not be abandoned too soon. If the tumor is favorably imbedded, the rapid performance of the operation will check the violent hemorrhage most surely, because the cut vessels of the capsule may retract, and because the tumor, which has been largely separated, itself acts as a tampon. Moderate hemorrhages may be kept within bounds by occasional injections of hot (50° C) or ice-cold water, perhaps with the addition of chlorine water. Chloride of iron should be employed only in the direst necessity, because it is apt to produce extensive thrombosis.

AFTER-TREATMENT.—DANGERS OF THE OPERATION.

After the bleeding is checked floating remnants of the capsule are carefully removed with the scissors and the uterine cavity is disinfected. The most effective disinfectant is corrosive sublimate, but on account of the danger of poisoning, it may not be used in the form of injections. We obtained very good results from swabbing the cavity with sponges dipped in a solution of corrosive sublimate (1:1000). An iodoform tampon is placed in the vagina and the abdomen made immovable by a cotton bandage. Subcutaneous injections of ergotin prevent secondary hemorrhage, diminish the intra-uterine wound surface, and oppose the formation of extensive dilatation-thrombi.

Formerly, a glass tube was inserted into the uterus after incomplete operations, and disinfectant injections or permanent irrigation employed. Nevertheless, the decomposition of the remnants of the tumor could not be prevented.

Great improvement in this regard has resulted from the use of corrosive sublimate and iodoform. Kaltenbach secured a perfectly aseptic recovery in two cases by the use of corrosive sublimate and iodoform in the manner mentioned above. In both cases the operation was subsequently completed successfully, in one at the end of a year.

The prognosis depends mainly on the facility with which the operation is performed. The hemorrhage and danger of sepsis increase with its duration. In operations which lasted several hours, we have repeatedly seen the beginning of decomposition in the torn tumor, which had been bathed in air and genital secretion. Incomplete operations are particularly dangerous, because it is extremely difficult to keep the uterine cavity aseptic.

In enucleation we always have to deal with more or less incalculable factors, and in doubtful cases, we therefore prefer apparently severer operations, because the latter may be performed surely under antiseptic precautions.

The condition of the patient prior to the operation also exerts considerable influence on prognosis; severe anæmia predisposes to marantic thrombosis, and diminishes the power of resistance to fresh hemorrhage and to the action of infecting substances. In spontaneously degenerating myomata, absorption of deleterious substances often takes place before the operation. This is still more the case if, after an unsuccessful operation, the attempt is repeated while the tumor is in a gangrenous condition. The operation is then apt to give rise to the renewed entrance of putrid masses into the freshly opened vessels. The operator is also extremely exposed to the danger of septic infection in such cases, because his fingers may be injured by the sharp hooks or other instruments.

Severe hemorrhage is the chief accident during the operation, and has repeatedly proved fatal, especially if there is a rupture of the uterine walls into the abdominal cavity. Injuries to the uterus play a great part among fatal cases, although penetrating wounds of the organ sometimes run a favorable course. Mikulicz and Czerny successfully sewed the opened peritoneum. In Freund's case the parametrium was opened, the cellular tissue between the bladder and uterus exposed; this was followed by subcutaneous emphysema over the entire body. The latter was relieved by compression and produced no further disturbances. Another observation by Freund proves that the signs of perforative peritonitis may result from causes other than injuries to the uterus. Death on the third day after an easy enucleation; the autopsy showed exit of pus from the left tube. Inversion of the uterus during the operation is much less serious, if it is recognized at once and replaced. It may even facilitate enucleation or the application of sutures when the uterine wall has been injured. Atlee mistook the inverted uterus for a portion of the tumor and extirpated it. Inversion sometimes occurs spontaneously after enucleation of a large tumor.

Thus, after enucleation of a myoma which extended close to the peritoneum, Bischoff observed an inversion as large as a hen's egg, which contained loops of intestines and descended into the vagina. As attempts at inversion proved useless, further descent was prevented by a tampon. The inversion gradually diminished spontaneously in size and complete recovery occurred.

The most frequent causes of death after enucleation are sepsis, putrid poisoning and pyæmia. The thromboses of the veins of the pelvis and thighs, with or without coincident infectious processes, sometimes prove fatal from exhaustion, extensive decubitus or embolism after a long illness.

In one of Schroeder's cases the axillary vein was thrombosed. Hegar described the following interesting case: Febrile condition after the operation, which was terminated in two sittings. Chill on fourteenth day after operation; five days later thrombosis of left crural and saphenous veins, later on right side. On the thirtieth day sudden pain in abdomen, vomiting, diarrhœa; colicky pains; foul smelling, later bloody stools. Difficulty in respiration, palpitation of the heart. Death on the fortieth day. Autopsy: old adhesions between bladder, left ovary and uterus. Abscesses in left ovary. Embolism of inferior mesenteric artery and branch of right pulmonary artery. Thrombi of left crural vein softened centrally. On inner surface of the moderately enlarged uterus a smooth cicatrix injected here and there. No changes in the muscular walls. A few dry clots in the veins of the broad ligaments.

Conception has been observed repeatedly after successful enucleations. In rare cases the tumors relapsed. In Hutchinson's case a second tumor developed four months after the removal of a tumor as large as a child's head. Renewed enucleation. A few months later another relapse, and death after repeated attempts at excision. Martin observed a similar case.

We will refer finally to certain operations for broad-based submucous and interstitial tumors of the uterus, which purpose the destruction of the tumor by necrosis. The elimination of the necrotic tumor is either left entirely to nature or it is facilitated by manual or instrumental means. The first operation of this kind was described by Baker Brown. After incision of the capsule he enucleated the tumor as far as possible, then penetrated the tumor with a pair of scissors which cut outwards, and endeavored to destroy as much tissue as possible. In other cases he excised wedge-shaped pieces of the tumor or bored into it with tubular instruments. (Obst. Trans. I. p. 329 and III. p. 67).

Greenhalgh employed the actual cautery for incising the capsule and destroying the tumor; after gangrene set in the tumor was removed partly by manual aid. He adopted this plan in three cases of retrovaginal tumors which were not accessible through the os uteri; the most projecting part of the vagina was first divided with the actual cautery. In one case recovery ensued after several applications of the cautery to the gangrenous tumor; in two others death resulted from pyæmia and peritonitis. (Medico-chirurg. Trans. LIX. p. 876.)

EXTIRPATION OF POLYPI.

Anatomical Conditions.

The two most frequent varieties of pedunculated tumors of the inner surface of the uterus are the fibrous and mucous polypi; pedunculated papillomata are also found in the vicinity of the os uteri. Sarcomata and cancroids of the inner surface of the uterus present a constriction of the base rather than a true pedicle.

Fibrous polypi grow most frequently from the fundus and body of the uterus, and are usually not larger than a goose egg. But cases have also been reported in which the tumors weighed ten to twelve, or even twenty-nine pounds. After these large tumors project from the uterus they fill the pelvis and finally press the perineum outwards, or the larger part of the tumor is situated above the pelvis. In the latter event the uterus is displaced upwards, and appears occasionally as a cap-like appendix to the outer surface of the tumor at the level of or even above the umbilicus. As soon as the polypi attain a certain size they are pressed into the cervical canal and finally into the vagina, partly by uterine contractions, partly by their own weight. At the same time the pedicle continues to grow longer. In rare cases partial inversion of the uterine wall develops. Fibrous polypi are generally club-shaped or pear-shaped; they are sometimes constricted like an hour-glass by the tense edges of the os uteri. The friction of the tumor against the cervix and vagina may give rise to ulcerations and adhesions of these parts.

The pedicle of fibrous polypi is usually not thicker than a quill or a thick finger. But there are all possible gradations between sub-mucous myomata with a narrow base and pedunculated tumors. As a rule the pedicle is short, so that the polypus is closely applied to the surface of the uterus; in rare cases it is several centimetres in length.

The vessels of the pedicle are almost always very small and retract thoroughly after section. The statements of older authors concerning pulsating vessels in the pedicle are based on error, or on mistaking the condition for polypoid elongation of the lips of the cervix.

Fibrous polypi are rarely multiple, but they are often associated with interstitial or sub-serous myomata.

The cervical canal is the favorite site of mucous polypi, and they are often present in larger numbers. They do not often exceed the size of a hazel-nut, and rarely attain the dimensions of a hen's egg. The smaller ones are round or moderately flattened; on further growth the pedicle elongates so that the shape resembles that of a fig.

INDICATIONS AND CONDITIONS.

The patients almost always consult the physician on account of hemorrhages and sero-purulent discharges, but sometimes not until large intra-vaginal polypi have produced the most severe symptoms of compression of the pelvic organs.

At the present time artificial dilatation of the cervical canal has opened a new field, inasmuch as it permits very early extirpation of small polypi which are concealed in the uterine cavity. Admirable results are afforded by dilatation with hard rubber tents; they often enable us to make the diagnosis and remove the tumor in the same sitting.

Kaltenbach dilated, at one sitting, the rigid cervix of a woman aged fifty years, discovered a polypus whose furthest point was 4 cm. from the external os, and extirpated forthwith a tumor as large as a hen's egg.

When the diagnosis of a pedunculated tumor is certain, there is no contra-indication to its removal. Infantile genitals, advanced age or extreme anæmia constitute no contra-indication. Pregnancy renders the indication so much more pressing. Large polypi growing from the lower segment of the uterus, may constitute a mechanical obstruction to labor, or give rise to severe hemorrhages. During childbed they often become necrotic or undergo gangrene from the contusion suffered during delivery, and may give rise to self-infection. As a rule the operation does not interfere with pregnancy. Even tumors weighing three and a half pounds have been extirpated without producing such an effect. In several instances large polypi have been mistaken, during labor, for the child's head, and have been extracted with the forceps. Saexinger reports a case of this kind with regard to a calcified tumor. Ferguson removed a soft myoma with the forceps and ruptured the uterus; the patient died at the end of forty-eight hours.

TECHNIQUE AND PROGNOSIS OF POLYPUS OPERATIONS.—CRITICISM OF THE METHODS.

Excision is the chief method of removal of uterine polypi. Torsion, the use of the *écraseur* or cautery loop are not always applicable, and rarely present an advantage over excision. The use of the ligature and destruction of the polypus with caustics or the actual cautery are obsolete.

Long-handled scissors, curved on the flat and blunt anteriorly (Cooper and Siebold), are employed for excision. In some of the newer instruments the blades are again crossed near the handle. (Fig. 162.) This permits considerable elongation of the instrument without compelling us to separate the handles more than usual in order to secure a certain separation of the blades. Knife-like polypotomes are less useful. (Fig. 163.)

When the insertion of the pedicle can be exposed, the operation is performed in lateral decubitus, under the control of the sight. The dorsal or breech-dorsal position should be employed when the tumors are larger, because the pedicle can only be reached by the aid of the finger, and specula would prove a source of disturbance. It is often desirable, in such cases, to control the fundus of the uterus through the abdominal walls.

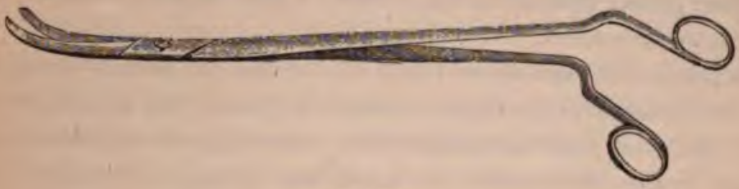

FIG. 162.

Narcosis is necessary only in very sensitive individuals and difficult exposure.

The operation is very simple if the polypus has descended so low that its pedicle is visible or can be reached with the fingers. It is grasped with a Museux[1] or Greenhalgh forceps (Fig. 161) (an obstetric forceps may be employed if the tumor is large), and is drawn slightly downwards by means of rotatory movements. Violence may not be employed, since this may result in inversion or rupture of the uterine walls. When the pedicle has been made tense in this way, the scissors or polypotome is introduced under the guidance of one or two fingers of the left hand, and the pedicle is cut. The site of incision is immaterial, since even long remnants of the pedicle retract completely. We must be on our guard against mistaking a groove in a conglomerate fibroma or an hour-glass constriction, produced by the edges of the os, as the pedicle proper.

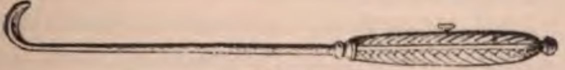

FIG. 163.

After the pedicle is cut, the extraction of the polypus is usually unattended with any further difficulties. But even in small, intra-uterine tumors it may be necessary to incise the tense edges of the os uteri. The obstetric forceps have been used repeatedly in the extraction of very large polypi. If the tumor meets with an obstruction at the introitus vagina, it is better to diminish the size of the tumor than to incise the perineum or labia.

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[1] Very serviceable forceps have been devised, whose double hooks grasp towards the flat, not towards the tip of the forceps.

The pedicle cannot be reached, in some cases, until after the separation of adhesions of the tumor to the vagina or cervical canal. This is easily done with the fingers or spatula-shaped instruments.

Much greater difficulty is experienced in those cases in which the pedicle cannot be reached.

In polypi which are inserted into the fundus, the pedicle usually cannot be reached with the fingers, because the tumor fills the uterine cavity. We must then inform ourselves concerning the insertion of the tumor by the careful use of the sound and attempts at rotation. Any partial inversion of the uterine wall, which may be present, may be detected by careful bi-manual palpation. After all these points have been ascertained, the curved scissors are passed carefully between the tumor and uterine walls to the pedicle, and the attempt made to cut the latter by several superficial cuts. Injury to the uterus can hardly occur if the scissors is directed towards the surface of the polypus and vigorous traction on the latter is avoided. If the pedicle cannot be reached in this way on account of the lack of room, the tumor must be diminished in size. In very large polypi, which fill the pelvis or even project in great part above the pelvis, the road to the insertion of the tumor can only be made gradually by diminishing its size. Chassaignac excised wedge-shaped pieces of the tumor, while others rendered it compressible by excavating its interior. A much better plan is the operative elongation of the polypus, as recommended by Simon. Transverse incisions are made with Cooper's scissors through the tumor and its capsule at various levels and on opposite sides. The polypus is then elongated to such an extent, that the insertion can finally be reached. Hegar produced even more marked elongation, by making spiral incisions which extend to the middle of the body of the polypus. By the latter means tumors which are entirely intra-uterine may be drawn in front of the external genitals, and a good hold for traction is also secured.

Artificial elongations of the polypus must be effected by a few vigorous cuts of the scissors, in order that the loss of blood may not prove dangerous from the long duration of the operation. The diminution in size occurs very rapidly and completely, if the polypus contains cystic or hemorrhagic cavities. As a rule, the hemorrhage following incision of the pedicle is almost *nil.* Slight hemorrhage may be checked with ice water or hot injections. In severe hemorrhages the cervical or uterine canal must be tamponed. If the bleeding place can be exposed it is ligatured, or a small chloride of iron wad is pressed against it. Among two hundred operations Dupuytren observed severe hemorrhage in only two cases, and these required the tampon. Hardly any fatal hemorrhages have been reported, except by the older physicians.

Mucous polypi may be removed by torsion or tearing with polypi forceps. They may often be removed with a volsella or with the curette introduced for diagnostic purposes. Even the pressure of a sponge tent may destroy small polypi; they adhere to the sponge and are removed with it.

The tearing out of fibrous polypi is a dangerous procedure, inasmuch as it is apt to produce inversion. Torsion is applicable, at the most, in very small, thin pedicled, easily movable tumors; it is preferable to other methods only when the pedicle is inserted into the fundus. The small tumor is grasped with an adjustable forceps, and the instrument is turned around its long axis until the pedicle yields. If great resistance is experienced, some other method must be adopted.

The cautery loop and *écraseur* are preferred by certain gynecologists, and the latter instrument has been considerably improved. Braxton-Hicks devised an instrument whose loop is formed of two to six twisted, welded steel wires, and can be placed at any angle to the handle. A still better instrument is that of Meadows; its single wire is more flexible, and at the same time firmer than that of Hicks's instrument. In addition the loop can be drawn completely into the handle through a narrow slit, so that the tissues will be surely divided. The application of the *écraseur* and cautery is very difficult and tedious when the pedicle is difficult of access. If the mode of insertion of the tumor requires that the loop be placed at an angle to the loop-carrier, or if the pedicle is very thick, the wire often breaks. The supposed protection against hemorrhage need not be considered, since this is hardly to be dreaded. Nor does the instrument offer an absolute protection. Bayard observed, after the use of the *écraseur*, a dangerous hemorrhage which could only be checked by ligature. The instrument has repeatedly injured the uterine walls if these were inverted by traction or the pedicle was very broad. Tillaux even penetrated the abdominal cavity with the *écraseur*; the patient died of peritonitis. Boeckel observed fatal tetanus after the use of the instrument.

If the pedicle can be exposed completely, a bloodless operation may be performed by cutting the pedicle with the knife-shaped thermo-cautery, or by applying a silk or elastic ligature and then cutting off the tumor.

In the absence of unfavorable conditions, such as excessive size of the tumor, broad pedicle, rigid cervix, hemorrhagic diathesis, etc., the extirpation of polypi is a very mild operation. Hemorrhages and accidental injuries can be avoided with almost absolute certainty. Infectious diseases are very little to be feared on account of the small wound and the short duration of the operation. Nevertheless we should not neglect careful disinfection of the field of operation. Fatal sepsis has been observed repeatedly when such precautions were neglected In some cases the sepsis was the result of preliminary forced dilatation, or the patient had been infected by the gangrenous tumor prior to the operation

Formerly the chief method of operation consisted of slow constriction of the polypus with hemp or silk ligatures. The number of instruments used for this purpose was legion.

The ligature owed its popularity chiefly to the fear of hemorrhage. Slow constriction was attended with serious disturbances, because the polypus generally became very much swollen, and caused pressure on the bladder and rectum. It was often necessary to renew the ligatures 20 times, or it finally became necessary to use the knife or scissors. The chief objection to this plan is the great danger of infection on account of gangrene of the tumor. Lee lost nine cases among 49 treated with ligatures. Mac Clintock lost three cases among ten patients. The choice of the material of the ligatures has very little effect on this danger. The tumor becomes gangrenous without external infection under the influence of the vaginal secretion, and then infects the vessels of the pedicle or the injured inner surface of the uterus.

Violent hemorrhage and tetanus have also been observed after ligature.

REMOVAL OF SURFACE PROLIFERATIONS AND TUMORS FROM THE UTERINE CAVITY BY SCRAPING.

Surface proliferations or new growths on the uterine mucous membrane can only be excised through the natural passages when situated in the cervix. In the higher parts of the uterus, they can only be destroyed with caustics or scraped off by means of special instruments. The latter plan, which endangers adjacent parts to a slight extent, renders possible the much more complete removal of morbid products than the exclusive use of severe caustics.

In 1846 Récamier devised the curette for the removal of granulations from the cervical canal. (Fig. 164.) Simon employed this method in malignant tumors of the uterus. Fig. 165 shows Simon's sharp spoon. We were the first to call attention to the use of the curette for diagnostic purposes, and for the treatment of chronic endometritis corporis.

The curette and scraping spoon are employed in the uterus:

1. In malignant tumors of the inner surface of the uterus, in which more radical operations cannot be performed. The hemorrhage and gangrene can thus be relieved for a considerable time. In some cancers and sarcomas, which were confined to the mucous membrane of the body of the uterus, a tolerable existence was secured for many years by repeated curetting. Nor is even radical recovery excluded in beginning malignant degeneration of primarily benign adenomata.

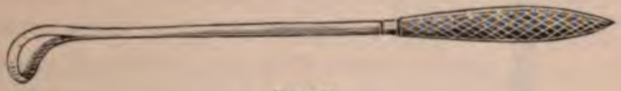

Fig. 164.

In carcinoma of the cervix curetting is almost always employed as a preliminary to the application of the actual cautery, in cases which do not admit of operation, or when, after excision, a relapse occurs in the form of papillary excrescences.

2. In the various forms of chronic endometritis and the abnormal secretions and hemorrhages to which they give rise in such cases. The mucous membrane is either uniformly thickened or merely covered in places with soft spongy moss-like proliferations ("granulations" of the French writers, fungous endometritis of Olshausen). These conditions include various groups. We have to deal either with simple hyperplastic and œdematous folds of mucous membrane, in which all the elements of the mucosa are uniformly thickened, or the proliferation of the glands or of the interglandular cellular tissue occupies the foreground. In interstitial endometritis the proliferations consist chiefly of small cell granulation tissue

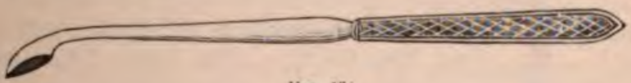

Fig. 165.

or of a firm, fibrous stroma. This variety often follows abortions, in which remains of the chorion or decidua have been retained.

3. In benign adenomata. The processes of proliferation described above sometimes form a transition to true tumors. Diffuse or circumscribed adenoma is especially apt to develop from the glandular form of endometritis. The adenoma may then undergo cancerous degeneration, and the interstitial form of endometritis is also said to become converted, at times, into sarcoma.

4. For diagnostic purposes. Whenever abnormal secretions and hemorrhages, which cannot be explained in any other way, indicate an affection of the inner surface of the uterus, the curette is the most certain aid in making an exact diagnosis. Portions of the diseased mucous membrane, small mucous polypi or particles of a tumor, are thus obtained for microscopical examination. If marked pathological proliferations are found, there is usually no objection to employing the curette at once for curative purposes.

Instruments.—Curettes of varying breadths (4 to 12 mm.) are used almost exclusively for scraping the inner surface of the uterus. It is best to restrict the use of the sharp spoon to malignant growths of the cervix. For cases of flexion Kaltenbach devised curettes whose shaft was bent at an obtuse angle 4 to 5 cm. from the tip. (Fig. 166.) These curved instruments are also well fitted for reaching the partes keratinæ, which are otherwise accessible with difficulty. Thomas recommends a blunt loop of copper wire for the removal of soft vegetations, and Mundé employs this instrument for the removal of small placental particles after abortion. Martin uses a narrow spoon-shaped steel curette (Fig. 167).

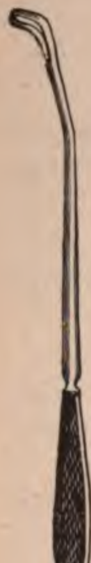

Fig. 166.

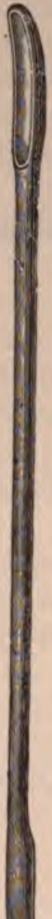

Fig. 167.

Preliminary dilatation of the cervical canal is usually necessary only when large instruments must be employed in cases of malignant tumors. Narrow curettes (4 to 5 mm. diameter) suffice for diagnostic purposes and the removal of soft proliferations. If such an instrument meet with an obstruction at the external os (in exceptional cases), the latter is incised superficially with the knife or scissors. Stenoses of the internal os must be relieved by hard rubber tents. We have not met with such cases, inasmuch as the uterus is usually flaccid and the cervix dilated in advanced diseases of the mucous membrane. Obstructions at the internal os in fixed retroflexions can only be overcome by the use of curved instruments.

Recent inflammatory processes in the ligament and uterine appendages form temporary contra-indications against curetting. Forcible traction on the uterus is to be avoided in old tubal changes. If gangrenous processes on the diseased mucous membrane occur after abortion, the indication for curetting is so much more urgent. But the uterine cavity must be carefully disinfected before and after the operation.

The operation may be performed in the lateral or dorsal position. The latter is preferable if there is any reason for observing the condition of the uterus through the abdominal walls. Exposure of the vagina offers the advantage that the removed masses are visible forthwith. After fixation of the anterior lip the curette is pushed to the fundus like a sound, and then passed, with scraping movements, over the various surfaces of the uterus. Diseased parts are generally recognized by their mossy softness. In circumscribed spots the curette enters a spongy tissue, which is easily separated from its base, while the instrument finds no hold in healthy parts. Malignant growths, which have eroded the muscular walls, are characterized by their uneven and fissured base.

The scraping is continued until the surface is smooth and all removable tissue has been carried off. Contact with the muscular coat produces a creaking sound, which is even audible at a distance. In erosion of the muscular walls by malignant new growths, this scraping is often heard from the beginning. If the curette finds much material, the masses, mixed with clots of blood, appear alongside the instrument and may be examined at once If possible, the curetting should be completed before the instrument is withdrawn. The walls are explored methodically, special attention being paid to the horns of the uterus, which are a favorite site of fungous excrescences.

As a rule, the hemorrhage is insignificant, or at least quickly subsides after the pathological structures are removed. In exceptional cases of malignant tumors and abortion, we have observed severe hemorrhages, in the latter condition only when remains of the chorion were left behind.

The pain is usually slight, so that narcosis is necessary only in very complicated cases and in very nervous individuals.

After the operation the uterine cavity must be cleaned and disinfected. Some recommend disinfectant irrigations with a double catheter or Braun's syringe. It is simpler to wash the uterine cavity with concentrated disinfectant solutions, such as carbolic acid (15 per cent.), or corrosive sublimate (1 per cent.) We always follow curative curetting with a thorough brushing or cauterization of the uterine cavity. The former suffices in simple endometritis or sub-involution. The application of strong tincture of iodine produces vigorous contractions of the uterus, and accelerates involution by removing fluid from the tissues. In protracted hemorrhages we sometimes use liq. ferri. Cauterizations with fuming nitric acid or solutions of chloride of zinc are used in extensive adenoma, and in suspicious and malignant forms of tumor. It is to this procedure that we attribute the fact that we have seen relapses so rarely even in suspicious forms of adenoma, which had been regarded as carcinoma and sarcoma by competent authority.

In order to allow the caustics to act directly on the uterine walls the latter are first cleaned with cotton. This is done with thin rods of pine, which have a shallow groove around the tip, and are firmly surrounded with dressing cotton. These are passed into the uterus with a slight rotary movement, are allowed to remain for a few moments, and are then withdrawn, covered with blood and shreds of tissue. The rods are destroyed as soon as used, and we are thus spared the trouble of unrolling the cotton, a somewhat tedious manipulation when metallic sounds are employed. The introduction of three to four rods is usually necessary, for completely drying and cleansing the uterine cavity. Finally, they are impregnated with the suitable fluid, introduced, and allowed to remain in the uterus for a few minutes.

Scraping the uterine cavity was long branded as a rough method. Among many hundred cases we have never seen any bad results from its use, and we regard it as one of the most successful manipulations in operative gynecology. Slight elevations of temperature and tenderness of the uterus are produced only after imperfect disinfection, forced dilatation or too severe cauterization. But the suitable cases for the curette must be carefully selected, and due attention paid to temporary contra-indications and antiseptic precautions. Finally, the patient should stay in bed several days after the curative use of the curette.

The application of scraping instruments becomes dangerous if the uterine walls have been thinned by malignant tumors or are in a condition of marked fatty degeneration, as the result of previous births and abortions. Under such circumstances the bladder or abdominal cavity is apt to be perforated, especially if the sharp spoon is used. Among one hundred of Récamier's operations the uterus was perforated three times. Spiegelberg also perforated a cancerous uterus. After curetting a gangrenous melanotic carcinoma of the fundus Bischoff observed peritonitis from rupture of a subperitoneal nodule into the abdominal cavity; no other solution of continuity.

Schultze has recently objected that, in circumscribed affections, not alone the diseased parts but likewise normal mucous membrane is removed to such an extent that subsequent conception is made difficult or impossible. On the contrary, we have seen, after the relief of endometritic processes, the tendency to habitual abortions disappear, or conception occur after a long interval.

It happens occasionally that benign adenomata relapse, even if it seems impossible that there could have been any further development of parts of the tumor which were left behind. Thus, Kaltenbach has removed large masses of adenoma three times within eight years from one patient. The hemorrhages ceased forthwith and the menses become regular after each curetting. Indeed the woman passed through a normal pregnancy in the interval. Two and a half years have elapsed since the last application of the curette.

OPERATIVE TREATMENT IN IMPACTION OF UTERINE FIBROUS TUMORS IN THE PELVIS.

Almost all kinds of fibrous tumors of the uterus may become impacted in the pelvis, and produce the most violent symptoms of compression. Impaction of sub-mucous and intra-ligamentary myomata has been already discussed. The fundus of the retroverted uterus, which is infiltrated with interstitial myomata, sometimes drops into the concavity of the sacrum, and is prevented from rising by the projecting promontory. Symptoms of impaction are produced much more frequently by sub-serous fibromyomata, with a broad or pedunculated insertion into the posterior uterine wall, inasmuch as they grow into the dilated Douglas's sac behind the vagina. Impacted myomata generally grow from the cervix, but those which are inserted higher, especially if they are pedunculated, may also become impacted in the pelvic cavity.

The symptoms of compression first affect the urinary organs and rectum; later, neuralgic and paralytic symptoms make their appearance. The compression may prove dangerous to life when the tumor rapidly enlarges from venous stasis, inflammatory processes, or pregnancy. Impacted myomata may constitute an unconquerable obstacle to the passage of the child during delivery.

Charles Clarke was the first who recommended pushing up the tumor towards the abdominal cavity, in order to relieve the incarcerated pelvic organs. Except during pregnancy this may be done in all cases in which the tumors are not intra-ligamentary or adherent. The pregnant uterus may prevent this manipulation by closing the entrance to the pelvis and at the same time diminishing the space in the abdominal cavity, while increasing the intra-abdominal pressure.

The tumor is pushed up most readily in those positions in which intra-abdominal pressure is least, *i.e.*, the knee elbow or latero-abdominal position. In these positions the weight of the tumor also acts favorably. The rectum furnishes the best starting-point, inasmuch as the tumor may be grasped more fully than through the vagina, and the pressure may be exercised upon higher parts. Two fingers, if necessary half the hand, are passed into the rectum, and the tumor pushed, with gradually increasing force, in the sacro-iliac region past the promontory towards the abdomen. If, in the knee-elbow position, air is allowed to enter the rectum, the positive atmospheric pressure favors the entrance of the tumor into the abdominal cavity, whose pressure is less. If the first attempt fails, it may be repeated in various positions, with or without chloroform, through the rectum and vagina. The attempt should not be abandoned too early during delivery, and should be repeated after rupture of the membranes or the artificial removal of the largest possible amounts of amniotic fluid. Impacted tumors have repeatedly passed upwards under the influence of the pains, after the escape of the amniotic fluid. Cases have been reported in which the tumor ascended spontaneously after puncture, although only a little bloody fluid was removed.

As a matter of course the ascent of the tumor merely relieves the results of the impaction. But further operative interference is excluded in many cases, because the tumors are often small in size and produce no other disturbances. We have treated a number of women, especially at an advanced age, who felt well permanently after the ascent of the tumor.

If the attempt proves unsuccessful, it may become necessary to extirpate the tumor through the abdominal walls or vagina, or, in cases of pregnancy, to make an artificial passage for the delivery of the child. But Cæsarean section has been attended with remarkably bad results in impacted uterine fibromata. Among twenty-eight cases collected by Cazin, only four recovered; among forty-three cases collected by Sanger, seven recovered. A large number of deaths resulted from the changes in the tumor produced by delivery, and better results may be expected if the tumor is removed with or without the uterus. It is true that four Porro operations performed on account of the complication of delivery with fibromyomata terminated fatally, but the results obtained from myomotomy and supra-vaginal amputation of the uterus during pregnancy, lead us to expect better results in the future.

OPERATIVE TREATMENT OF INVERSION.

ANATOMICAL CONDITIONS.—INDICATIONS.

The treatment of recent puerperal inversions belongs to obstetrics. A purely gynecological interest attaches only to old puerperal inversions, and those produced by intra-uterine tumors. The latter have been observed particularly in fibromata and sarcomata, which have a broad or pedunculated insertion into the fundus uteri. The inversion occurs spontaneously from the weight of the tumor and subsequent attempts of the uterus at expulsion, or it is produced by vigorous traction during attempts at extirpation. It may vary from simple depression of the fundus to complete inversion. In the majority of old, puerperal inversions, the fundus projects very little into the vagina, as the inversion generally ceases at the internal os. If the cervix takes part in the displacement, this occurs in an irregular manner, inasmuch as the anterior cervical wall, on account of its firm and broad connection with the bladder, is inverted much less deeply than the posterior wall, which is adjacent to the recto-uterine fossa. The sound enters much further into the pocket-like furrow between the inversion and cervix anteriorly than it does posteriorly.

The peritoneal pocket within the inverted uterine body, the so-called inversion funnel, is very small in old inversions, corresponding to the involution of the entire organ. Upon a horizontal section it forms a transverse oval, narrow slit, and its depth, from the level of the internal os is hardly 2.5 to 3 cm. It contains only the median portion of the broad and round ligaments and the beginning of the tubes and ovarian ligaments; the intestine or omentum may adhere to the edges of the inversion funnel. Recent inversions contain the larger part of the broad ligaments, the ovaries, considerable portions of the intestines and omentum, and even a part of the bladder. After long duration of the inversion the internal peritoneal surfaces often adhere as the result of perimetritic inflammatory processes. This is important in two directions; it forms an obstacle to reduction, and at the same time it renders possible the removal of the insertion without opening the peritoneal cavity. The inverted organ may enlarge as the result of venous stasis or chronic inflammatory infiltration, but it is sometimes very atrophic. Circulatory disturbances, mechanical injuries and the constant soiling with urine and vaginal secretion, may give rise to more or less extensive ulcerations and subsequent adhesions to the walls of the vagina or cervix. Complete gangrenous exfoliation of the uterus has also been observed. Retraction sometimes takes place at the point of flexion of the inversion, and may interfere seriously with reduction.

The main symptoms of old inversions are the hemorrhages and profuse, foul-smelling secretions. The patients seek aid more rarely on account of the occurrence of gangrene, or the mechanical annoyances attendant on the position of the tumor in the vagina.

The first object of treatment is to reduce the inverted organ. This may be done with the fingers or instruments, or by the permanent introduction of certain apparatus.

METHODS OF REDUCTION OF OLD INVERSIONS.

Manual Reduction.—The patient being placed in the dorsal or breech-dorsal position, under chloroform, the half hand or the first three fingers are passed into the vagina, and grasp the inverted uterus. The other hand steadies the uterus through the abdominal walls, and controls the opening of the inversion funnel, in order to determine the direction of the pressure acting from within; at the same time it prevents the tearing of the uterus from the fornix by excessive pressure. The portio vaginalis may be fixed with loops of ligature or Museux's forceps, to effect the same object. Reduction may be effected in two ways. Either the part inverted last, *i.e.*, the part adjacent to the cervix, is first replaced by pushing up and compressing the inverted uterus *en masse*, or we first push against the fundus from the direction of a tubal opening and attempt to restore the inversion from this position by making one half pass the internal os after the other. Both methods may also be combined. Emmet exercises strong pressure upon the uterus with the vola manus and the fingers, and at the same time presses the tips of the fingers into the furrow at the cervix, in order to dilate the latter by separating the fingers. The pressure thus diminishes the size of the body of the uterus. The eccentric distension at the cervix dilates this part.

Courty grasps the rim of the inversion funnel, through the rectum, with two fingers curved like hooks, and pushes the inverted fundus upwards with the other hand in the vagina. Pate's method is similar, except that the edge of the inversion funnel is steadied by the index fingers, which have been passed into the bladder and rectum, while both thumbs push the fundus upward through the vagina.

As a general thing reduction is so much more difficult, the longer the duration of the inversion. It may be made impossible by adhesions within the inversion funnel, by the narrowness and rigidity of the cervix, by retraction of the uterine tissue at the site of flexion, and by the fact that the thickened and retracted peritoneal diverticulum within the inversion is too small to cover the swollen uterus completely. The fundus may sometimes be pushed back a certain distance, but falls back as soon as the pressure ceases. Nevertheless, success is sometimes attained in apparently unfavorable cases (twelve, fifteen and forty years duration) by protracted kneading of the body of the uterus, by repetition of the attempts, and by utilizing a favorable moment. when the uterus appears more flabby and yielding, as, for example, immediately after a hemorrhage.

Great swelling of the inverted organ, which may also interfere with reduction, may be relieved by prolonged rest in bed, iodine-glycerine tampons, and gentle massage. Fritsch recommends bandaging with Martin's rubber bands for the same purpose. Sims's incisions along the entire length of the inversion "in order to cut the circular fibres of the uterus, and thus remove one of the main obstacles to reduction," probably exercise their chief favorable effect by diminishing the size of the uterus. The resistance of the narrow and rigid cervix has been overcome by Barnes and others, by making several incisions into the tense edges of the os uteri.

A much less valuable means of reduction is the use of blunt instruments curved like a speculum, with a club-shaped or depressed, cup-like surface. Greater force can be employed with these instruments than with the fingers, but we are much less able to control the direction of the force and to avoid injuries.

The first attempts at reduction sometimes fail to push the fundus above the level of the external os. Under such circumstances the attempt has been made to retain the advantage gained by stitching the cervix beneath the partially reduced uterus, or by the introduction of an elastic vaginal tampon. The combination of attempts at manual reduction, *i.e.*, a sort of massage, with subsequent application of a vaginal tampon, has been found very useful. In a number of cases the partly reduced uterus was reinverted spontaneously, either with or without pains. In other cases the previously impossible reduction was effected very easily by manual means after protracted use of the tampons. In one case Tyler Smith kneaded the uterus daily for ten minutes, and then introduced a Gariel air pessary. At the end of eight days violent pains set in and the dislocation disappeared. West observed reduction, attended with pain, on the third day after tamponing the cervical canal with a rubber bag.

Recent observations have shown that reduction may be effected by a combination of the vaginal tampon and Braun's kolpeurynter. The distension of the vaginal fornix and the separation of the cervical walls produce contractions of the uterus and its muscular appendages, and pains like those of labor set in. The direct counter-pressure against the inverted fundus is of minor significance. After its introduction into the vagina, the kolpeurynter is filled with air or water, as far as the patient can tolerate without excessive pain. Now and then a somewhat forced dilatation of the bladder up to ½ litre is produced, or the entire apparatus is removed at times for hours or half a day.

A less effective and much more dangerous measure than the use of the kolpeurynter is the introduction of rigid apparatus, constructed like stem pessaries, whose upper end (consisting of a club-shaped button, rubber disc, a rubber disc filled with air, a nipple-like excavated plate) exercises permanent pressure against the inverted fundus, while the stem is fastened to a pelvic band by a T-bandage or elastic bands. Even springs have been used (White) to increase the counter-pressure.

Such apparatus exercise effective pressure on the inversion only after extreme tension and dilatation of the vagina and great compression of the uterine walls. A number of successful cases have been reported, but the apparatus is generally not tolerated for a long time, because it produces inflammation, pressure-necrosis, and high fever. Praël observed fatal peritonitis after the second application (lasting two days) of an egg cup-shaped instrument.

Thomas recommended a peculiar plan, which he has since abandoned. The inversion-funnel was exposed through the abdominal walls, the constricting ring dilated with a special dilator, and the uterus then reduced, but only after great difficulty. Recovery occurred, despite a perforating rupture of the vagina and a severe secondary hemorrhage externally and into the peritoneal cavity. In a second case, which was operated in the same way, the patient died of peritonitis.

REMOVAL OF INVERSIONS.

Some old inversions resist all our perfected methods of reduction. If the sequelæ of the inversion continue undiminished, the removal of the inverted organ remains as a last resort.

Excision is also indicated in inversions which are produced by broad-based sarcomata of the fundus. The complicating inversion then offers the convenient possibility of radical removal of the tumor with its base. In fibromyomata, as a rule, the tumor alone need be removed, whether it is inserted into the fundus by a broad base or pedicle. As a general thing the inversion then disappears spontaneously, or it can be easily reduced. In one case Schwarz was compelled to remove the entire inverted uterus, because several small myomata were situated upon it. Breisky observed an inversion which was produced by a myoma as large as a child's head. The pedicle ruptured and several arteries spirted. Ligature with wire, then excision of the tumor. No attempt at reduction on account of gangrene and partial necrosis of the uterine mucous membrane. Embolic hemiplegia twenty-four hours later.

Inversions have been removed by means of ligatures, excision, cautery loop, thermo-cautery and *écraseur.*

Slow constriction with ligatures of hemp or silk is obsolete. The constriction soon becomes insufficient, must be renewed repeatedly, and is not followed by exfoliation of the necrotic organ until after weeks of dangerous gangrene. Symptoms of shock often occurred on tying the ligatures, and necessitated the immediate discontinuance of the operation. Better results have been obtained from the elastic ligature, which causes exfoliation of the uterus in twelve to fourteen days. As a general thing the gangrenous uterus was removed below the elastic ligature at the end of a few days.

Simple excision with the knife, *écraseur* or cautery loop, without paying any attention to the peritoneal pocket within the inversion, is also to be deprecated. Unless the inversion is adherent, the peritoneal cavity is opened, and reinversion of the surface of removal towards the abdominal cavity may take place. The peritoneal opening is rarely large enough to permit protrusion of the intestine, but it renders the patient liable to infection through the vagina and cervical canal. The chief danger is the reinversion of the excised surface towards the abdominal cavity. This is so much more apt to occur, the more recent the inversion. The portions of the broad ligaments and their vessels, which are drawn forcibly into the inversion, retract most markedly. From the abdominal cavity we see in the middle the transverse oval wound surface of the uterus, which merges laterally into the elongated surfaces of incision of the broad ligaments (*vide* Fig. 168, after Spiegelberg). If the hemorrhage from the inverted wound surface is not entirely checked, and it rarely is, it takes place into the abdominal cavity. Here strong styptics may not be applied. The tampon merely converts the external into an internal hemorrhage; the application of cold is of little service. The attempt to

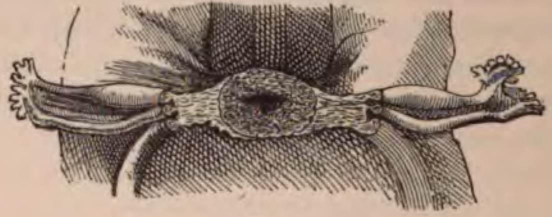

Fig. 168.

compress the bleeding vessels against the edge of the inversion funnel or to use acupressure with sharp hooks under the guidance of the finger, will rarely prove successful. If the hemorrhage is considerable, nothing remains but to open the abdominal cavity, and to ligate the bleeding vessels directly. In some cases reinversion does not occur immediately after the operation, but a few days later when the wound surface is suppurating. It then gives rise to secondary infection of the peritoneal cavity.

In old inversion with a narrow slit-shaped or superficially adherent peritoneal pocket, the dangers described may not set in. This is shown by the numerous good results obtained by the exclusive use of the *écraseur* and cautery loop, although no attention was paid to the closure of the peritoneal cavity. After galvano-caustic excision, the utero-abdominal fistula has been demonstrated repeatedly with the sound.

Nevertheless it must be regarded as indispensable that the method of operation should not be left to chance, and that the opening of the abdominal cavity and reinversion of the surface of excision must be prevented.

The attempt was formerly made to secure these objects by applying a preventive ligature for several days, but this did not prove successful. Either no adhesions were produced or they were so weak as to be unable to resist the tendency to spontaneous reinversion.

No better results were obtained from elastic ligatures. In one case Veit found no trace of adhesive inflammation, although the ligature was retained three days; this is also true of Spiegelberg's two cases (ligature retained four and eight days). Veit's patient died of peritonitis. In one of Spiegelbeg's cases the suppurating surface of removal was reinverted and a large intra-peritoneal exudation developed. Recovery in four weeks.

Kaltenbach formerly recommended the introduction of silver wires, or the stitching of the peritoneal pocket within the inversion by a few silver sutures, in order to secure the adhesion of the inversion funnel. As the circulation in the lateral parts was retained, necrosis was not to be feared, and the sutures could be retained until the adhesions were firm.

Other methods purposed the closure of the inversion funnel during the operation itself by ligatures *en masse* around the pedicle or by the application of ordinary sutures.

But all these methods are uncertain in comparison with constriction of the pedicle by means of a simple constricting or a perforating elastic ligature. If this is firmly applied around the projecting neck of the inversion, the body of the uterus below it may be removed with perfect security. The elastic ligature is allowed to remain, as the short stump is easily kept aseptic with corrosive sublimate and iodoform.

The mode of removal of the inversion is then a matter of minor importance. The uncertain *écraseur* has become superfluous on account of the certainty of checking hemorrhage with the elastic ligature. The *écraseur* sometimes gives rise to symptoms of shock, and is not entirely reliable as regards hemorrhage. It was therefore allowed to act with extreme slowness. Denucé speaks of an *écrasement* lasting twenty-four hours. Greenhalgh shortened the chain by one link a minute. The hemorrhage sometimes occurred when the chain first entered the brittle uterine tissue, but, as a general thing, not until the separation was nearly or entirely complete. Sims observed a frightful hemorrhage on the removal of the broken chain of the *écraseur*, but as the broad ligament of one side was not entirely divided, it could be drawn out and its vessels first compressed with the finger (which was introduced into the abdominal cavity) against the edge of the inversion funnel, and then ligatured.

The galvano-caustic cutting loop was especially employed by Veit and others, with and without previous ligature of the inversion. This method did not secure the patient against shock and hemorrhage. Rapid manipulation was followed by hemorrhage, slow manipulation by shock. Spiegelberg observed symptoms of shock after slow constriction and a feeble current. The symptoms appeared to be dependent on the contusion, inasmuch as they disappeared on the addition of another element. Hence, it seems advisable to constrict slowly with a strong current.

Spiegelberg regards it as a special advantage of the cautery loop that it cuts the tissues somewhat obliquely, so that the cut surface projects somewhat conically. If reinversion occurs subsequently, the eschar will be directed towards the cervical canal, not towards the peritoneal cavity.

Spencer Wells removed the inversion with Pacquelin's cautery after passing two needles crosswise through the pedicle, and applying an elastic ligature behind them.

The simplest operation is removal with the knife and scissors, and the operation is bloodless if an elastic ligature is applied. If we fear the subsequent slipping of the elastic ligature, the free edges of the peritoneum in the excised surface may be united with a series of sutures. These are inserted somewhat obliquely at the sides in order that they may cross the main course of the entering vessels.

The elastic ligature is discharged, with the stump, during the third week after the operation. It is always followed by adhesion of the portions of the peritoneum bordering on the edge of the inversion-funnel. This excludes the hitherto unmentioned danger of abdominal pregnancy, which may occur with a cervico-abdominal fistula as well as under analogous conditions after supra-vaginal amputation of the uterus.

Later publications distinctly show a considerable diminution of mortality. Almost all the cases reported in the last five or six years have recovered.

West's older statistics show the interesting fact that among twenty-one cases operated upon before the end of a year nine died, while among twenty-five operations performed after the inversion had lasted several years, only two ran a fatal course.

OPERATIONS IN VERSIONS AND FLEXIONS OF THE UTERUS.

1. *Operations in Anteversions and Anteflexions.—Union of the Anterior Lip of the Cervix to a Lower Part of the Anterior Vaginal Wall for the Relief of Anteversion and Anteflexion (?) of the Uterus.*

This method was recommended by Sims for marked anteversions, in which the uterus lay behind the symphysis in close contact with the considerably elongated anterior vaginal wall, and almost parallel with the latter. The first operation was performed in 1857 in an anteversion resulting from a fibroma situated at the fundus. When the anterior lip of the os was drawn down with a hook towards the urethra, the fundus was elevated almost to its normal position. Sims dissected two semilunar flaps out of the anterior vaginal wall, one in the fornix close to the anterior surface of the portio vaginalis, the other one and a half inch below, and united both raw surfaces with silver wire. Complete union occurred, and the patient was cured of all her symptoms, which affected chiefly the bladder.

In Germany Simon successfully perfomed this operation in a modified form as "transplantation of the anterior lip of the os" in a case of anteflexion. Instead of denuding the fornix, Sims denuded the anterior lip of the os uteri. This was united to a spot 3.5 cm. above the orifice of the urethra, and the anteflexion (?) and majority of the symptoms, particularly the dysmenorrhœa, were permanently relieved. As the point of adhesion was considerably elongated at a subsequent period, Simon advises that it be made broad, and that the lateral parts of the portio vaginalis be included as much as possible. Perhaps it would be advantageous to unite, at the same time, the posterior lip to the posterior vaginal wall.

Our experience concerning this operation is extremely restricted. There is no doubt that it will rectify the position of an anteverted uterus, provided that the anterior vaginal wall is firmly adherent to the symphysis. But, as a general thing, the symptoms dependent on anteversion rarely justify an operation. The latter is indicated, perhaps, in severe vesical symptoms, or when, in cases of sterility, the external os is to be brought into a more favorable position for conception. In anteflexions the favorable effect of the operation is confined to the elevation of the fundus of the uterus from the bladder, while the anomaly of shape and the symptoms dependent thereon continue. The disappearance of the dysmenorrhœa in Simon's case, is probably attributable to the loss of blood and the subsequent rest in bed.

Hegar's "extirpation of the uterus and both ovaries, with union of the uterine stump to the abdominal wound" was performed on account of the complex of reflex neuroses rather than the anomaly in the position of the uterus. The operation was essentially a castration with removal of the flexed uterus.

2. *Operative Methods in Retroflexions.*

Koeberlé's operation in a case of retroflexion, in which there was danger of ileus, was based on the observation of the effect of extra-peritoneal treatment of the pedicle after ovariotomy. If the uterus was retroflexed or retroverted before the operation, the union of the pedicle to the lower angle of the abdominal wound raised it out of Douglas's sac, and brought it nearer to the anterior abdominal wall. Whether this proves permanently successful is questionable, since the ligament is apt to elongate after a time.

Koeberlé's operation in 1869 was merely an ovariotomy with stitching of the pedicle in the abdominal wound. The retroflexio uteri had given rise to chronic constipation and other symptoms which embittered the patient's life. The cervix deviated to the right, the retroflexed fundus to the left, and between them the left ovary was felt as a movable tumor, as large as a hen's egg, above the left fornix. Laparotomy was performed, the uterus drawn out of Douglas's sac, drawn in front of the abdominal wound, and most of the left ovary excised with scissors. The remainder with the end of the tube and a portion of the broad ligament were fastened into the lower angle of the wound with a *serre-noeud,* so that the traction of this artificial pedicle kept the uterus in an almost normal position. The position of the organ was normal four years after the operation, but the patient suffered from severe hysteria. Koeberlé did not perform the operation solely on account of the retroflexion, but mainly on account of the extremely obstinate constipation.

Shortening of the round ligaments (Alexander-Adam's operation) has also been recommended for the relief of retroflexions. It is recommended particularly in freely movable retroflexions, complicated with displacement of one or both ovaries. It is said that the success has been observed repeatedly to have been maintained at the end of a year.

Technique of the Operation.—The round ligaments are exposed by an incision parallel to Poupart's ligament, and then followed until they assume a band-form. Freund recommended loosening them in the inguinal canal with a blunt ivory rod. The retroflexed uterus can now be straightened by pulling on the ligaments, a slight funnel-shaped depression being observed at the same time in the region of the internal inguinal ring. Both round ligaments are then cut and the central ends fastened with sutures to the small cutaneous wound.

Gardener fastens the exposed ligaments in a clamp and directs an assistant to push the cervix backwards while pulling on the ligaments. The withdrawn ligaments are tied around a ball of gauze and stitched to the skin with "kangaroo tendon."

A definite opinion concerning the value of the operation can not be given at the present time as it has hardly advanced beyond the shape of coarse experiment.

Attention has been called in Vol. I. page 121 to Freund's operation of inserting a lead wire into the anterior lip of the cervix and fastening it to the posterior branch of a Hodge pessary.

DIVISION OF THE CERVIX.—DISCISSION.

DEFINITION, HISTORY AND INDICATIONS OF DISCISSION.

The terms discission, hyster ostomatomy, trachelotomy, stomatoplastice, are applied to division of the entire cervical canal, or of the external orifice alone. The former operation, when it extends above the internal os, is also known as internal discission, the latter as external discission. The operation is sometimes preliminary to other operations, for example, the extirpation of intra-uterine tumors, or it may be employed for purely diagnostic purposes.

Simpson is the scientific founder of the operation in gynecology. He performed it in 1843, upon a woman who had been childless during seven years of married life, and suffered from violent dysmenorrhæa. At the end of four months she became pregnant. In the same year Jobert divided a stenosed os with the scissors, because the cervical canal above the stenosis had been distended into a sac filled with mucus. But it was not until the operation was recommended by Sims, that it met with its present extensive adoption.

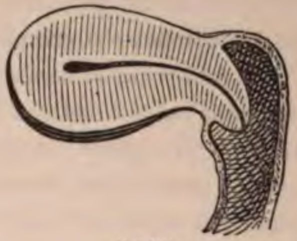

FIG 169.

Stenoses of the cervical canal, with their symptoms and sequelæ, constitute the main indication for the operation.

The narrowing chiefly affects the external or internal os, rarely the entire canal. Stenoses of the external os are by far the most frequent, and are often combined with conicity and rigidity of the portio vaginalis. (Fig. 169.) Impermeability of the internal os is generally the result of flexions, and is only exceptionally produced by true narrowness of the canal. These stenoses interfere with the exit of the menstrual blood and uterine secretions, and with the entrance of semen, so that the operation is indicated in dysmenorrhœal symptoms and sterility. The severity of the symptoms is not infrequently the result, apart from the stenosis, of other factors, such as thickening and proliferation of the mucosa, chronic endometritis. These factors alone may give rise to the same results as stenoses, and, by the stasis of secretion, may cause uterine colic and marked dilatation of the uterus above the narrowed part.

The value of discission has been called into question. Thus, the causal connection between stenoses and their sequelæ has been doubted. It is true that dysmenorrhœa is sometimes absent in congenital stenosis, but, on the other hand, the favorable effect of division in cases in which dysmenorrhœa and stenosis were combined, has been abundantly corroborated. It was also maintained that a canal, which would admit the instruments necessary for division, was not really too narrow. But a rigid instrument readily forces a narrow canal asunder, while the passage of fluid masses or coagulated blood may be prevented by mere hyperæmic swelling of the mucosa. Finally, the operation has been declared useless, because the wound rapidly unites. But this union may be prevented by proper after-treatment.

In dysmenorrhœa and endometritis discission not alone acts mechanically by facilitating the escape of secretion, but the local bleeding is also an important feature. The results in sterility are also satisfactory, and may even attain the proportion of recoveries (30.7 per cent.) assumed by Chrobak. But there is no doubt that too much was formerly expected from the operation, and it was often performed without sufficient examination of the entire genital apparatus of the woman, not to speak of the examination of the husband. Noeggerath justly claims that gonorrhœa, with its sequelæ in men and women, is one of the most frequent incurable causes of sterility.

In rare cases the cause of sterility is found in mechanical factors, particularly in changes of the lower part of the uterus. This is most probable when, in addition to stenosis, other anomalies of shape, position and consistence of the portio are present, which interfere with the entrance of semen and impede the dilatability of the cervix, as, for example, a conical, rigid portio. It is in such cases that the best results have been obtained from the operation. That division of the cervical canal is rationally indicated when the canal has an irregular shape and width, is shown, apart from the operative results, by other experiences. Thus, women, who had been sterile for years, conceive in rapid succession after the first childbed. This can only be attributed to the changes which parturition produces in the cervix, changes which are entirely similar to those produced by discission.

In some versions and flexions the operation is performed in order to give the os a more favorable direction for the entrance of semen. In anteversions, the anterior wall of the portio, in retroversions the posterior wall, and in latero-versions the corresponding lateral wall, is divided.

Hemorrhages in interstitial and sub-mucous myomata were formerly regarded as an indication. Baker-Brown, MacClintock and Nélaton independently made the observation that extensive division of the cervical canal diminishes or checks the hemorrhage in interstitial fibroids. Brown observed this in attempts at extirpation of intra-uterine tumors, which he wished to render accessible by dividing the cervical canal. He found that the hemorrhages ceased, even if the extirpation was unsuccessful, and explained this fact on the ground that, after division, the circular muscles at the internal os could contract firmly around the fibroid (self tampon.)

The operation is successful (usually temporarily) only in those submucous and interstitial myomata which extend to the internal os or into the cervix. The success apparently depends, therefore, on partial division of the capsule of the tumor, which renders possible the retraction of the vessels which are the source of the hemorrhage.

The division of the unyielding edges of the os is also employed occasionally as a preliminary to the extirpation of uterine tumors or careful palpation of the uterine cavity.

The contra-indications to the operation are recent inflammatory processes in the uterus and surrounding parts, which may be again provoked by the operation and particularly by the after-treatment. It is also to be avoided during the existence of an infectious secretion from the uterus, for example, in gonorrhœa, when ichorous tumors are present, or immediately after dilatation with tents. While we are able to disinfect the vagina thoroughly at the time of operation, this cannot be said with regard to the uterus. Proximity to the period of menstruation is less dangerous in this regard. We avoid this period but only on account of the after-treatment and the loss of blood.

If sterility is the indication for the operation, diseases of the ovaries and tubes which entail sterility or render conception undesirable, must be excluded; this is also true of infantile uterus. We have been repeatedly compelled to perform castration instead of the desired discission. Certain general contra-indications which may depend upon pregnancy, the general condition of the patient or organic diseases, must be taken carefully into consideration. Special stress is to be laid on profound anæmia, hæmophilia, diseases of the respiratory and circulatory organs, kidneys, etc.[1] The treatment of sterility after gonorrhœal salpingitis is almost useless. As a rule, moreover, the dysmenorrhœa due to this cause is also unimproved by discission. In such case the operation is not justifiable unless it is intended to relieve stasis of secretion in the uterus.

TECHNIQUE OF DISCISSION.

The operation is generally performed in a transverse (bilateral discission), rarely in a sagittal direction. Knife-like instruments were formerly employed which either cut from within outward (from the internal to the external os) or from without inward. The oldest instrument is that of Simpson (Fig. 170), which, by pressure on the handle, allows the projection of a blade whose amount of motion is regulated by a screw. Greenhalgh modified this instrument by using two concealed blades (Fig. 171) so that it was unnecessary to introduce the instrument twice. The introduction of this instrument may be difficult if the canal is very narrow. Greenhalgh was generally compelled to employ preliminary dilatation with blunt instruments. Moreover, these "metrotomes cachés" possess the disadvantage that, after establishing the amount of separation of the blades, this can no longer be controlled by the operator, and hence the incisions are often too deep. In addition, they do not give to the cervical canal the desired funnel shape, but make a uniform incision along its entire length. If the blades are separated slightly, the external os is not divided sufficiently, if they diverge too far, the injury of large arteries near the internal os may give rise to very dangerous hemorrhage, or the canal gapes to such an extent that the lips become everted.

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[1] One of Kaltenbach's patients, aet. 35 yrs., who was sterile during 8 years of married life, had an apoplectic attack. There was severe dysmenorrhœa, uterus large and thick walled, cervix elongated and rigid. Kaltenbach declined to operate on account of the atheromatous condition of the arteries. Six months later the paresis of the lower limbs had disappeared almost entirely, and after repeated requests on the part of the patient, discission was performed. Conception occurred forthwith, but the patient died in the 7th month of pregnancy from a second attack of apoplexy.

The metrotomes of Peaslee and Kuechemeister cut from without inwards. The former (Fig. 172) consists of a guiding rod, upon which the blade of a knife, rounded anteriorly, may be projected. The latter is a long-handled lancet knife with a blunt tip. A much more useful instrument is that of Sims (Fig. 173). It consists of a narrow, razor-shaped blade, which may be placed at any desired angle to the handle. The

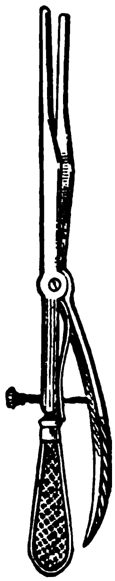

Fig. 170.

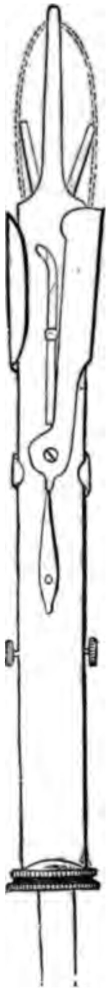

Fig. 171.

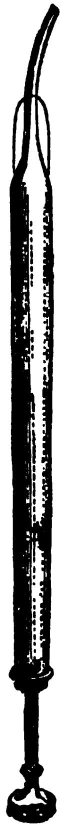

Fig. 172.

direction and depth of the incision are entirely under the control of the operator.

Sims steadies the portio vaginalis with a tenaculum, and introduces one blade of a scissors[1] (bent on the edge) into the cervical canal until the outer blade almost touches the insertion of the vagina at the side of the cervix, and thus divides the portio vaginalis on the right and left sides. He then introduces his metrotome and cuts the tissue situated between the end of the scissors incision and the internal os. If the patient is in the left lateral position, the knife, seen from the back, must be bent towards the right in dividing the left side and *vice versâ*.

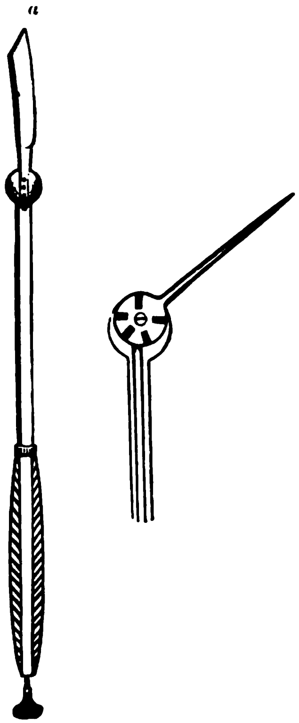

FIG. 173.

If the cervical canal is narrow we use Sims's metrotome almost exclusively, and fixate the portio vaginalis with an American volsella. Division of the angles of the os with the scissors is generally performed only when the portio is elongated, or when, in discission combined with amputation, both lips are to be removed separately. If the portio is normal we insert the knife at once as far as the internal os, and begin the division here, gradually deepening the incision towards the outside. As the cervical canal is to assume a funnel-shape, the incisions at the internal os need only be 2 to 3 mm. deep, while the external os should gape about 1.5 cm. We divide the internal os by several nicks with a herniotome or narrow-bladed, blunt-tipped bistoury.

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[1] As ordinary scissors always slip somewhat in cutting, and do not divide all the tissue grasped, Kuechenmeister attaches a little hook to the tip of one blade.

Modifications of the Operation.—If the portio is very much elongated or conical, we always combine discission with amputation and union of the mucous membrane, and lately perform wedge-shaped excision of each lip. In addition to the ordinary sutures anteriorly and posteriorly, Hegar sometimes draws down, on the sides, the cervical mucosa, which has been dissected off, and unites it to the fornix by several sutures, in order to make the canal more patulous at the sides. Chrobak has recently performed a similar operation. He makes two small, triangular flaps on the outer wall of the cervix, and unites them laterally with sutures. In order to secure considerable dilatation of a voluminous portio vaginalis, we have excised wedge-shaped pieces from one or both lips of the cervix. Gusserow again makes an incision after bilateral incision of each lip. Kehrer divides it into six to eight wedges, and the os thus becomes stellate and very patulous (radial discission).

In stenosis of the external os with ampulla-like dilatation of the canal, Fritsch makes, with a narrow knife, four incisions on the sides anteriorly and posteriorly. The sharp fold between each two incisions is grasped with a hook and removed with Siebold's scissors.

If the external os is to be dilated as a preliminary to the extirpation of a tumor, the edges, which are usually thin, are simply divided with scissors or a bistoury.

Schroeder and others have recently performed deep division of the entire cervix for diagnostic purposes. The operation is performed under an anæsthetic in the breech-dorsal position. Previous ligation of the uterine arteries through the lateral fornix. Deepening of the incisions through the lateral walls of the cervix with the bistoury. Closure of the incisions with sutures.

Sagittal Discission.—In flexion the internal os appears impermeable because the anterior and posterior walls of the uterus are in immediate contact, as in a bent, rigid tube. In such cases bilateral incision is often unsuccessful. Sims desires, therefore, to enlarge the space antero-posteriorly. In anteflexions he divides the posterior lip of the cervix with the scissors into two lateral halves as far as the vaginal insertion, and thence makes a longitudinal incision through the posterior cervical wall to the level of the internal os. He uses a knife very similar to his metrotome, except that the direction of the edge of the blade may be changed to any desired angle. Sims and Emmet have obtained good results from this method, which purposes the rectification of the uterine axis by displacing the external os backwards and upwards. But sagittal discission is much more dangerous than the bilateral operation, because the peritoneum is apt to be injured through the atrophic point of flexion, and a wound thus produced which is unsually exposed to infection.

In order to prevent reunion after Sims's operation, Kuester, after division of the posterior lip on both sides, excises a wedge (with broad median and sharpened lateral edges) from the posterior cervical wall, and unites the flaps by two sutures.

In order to prevent reunion of the upper angle of the wound, he dissects a narrow triangular flap, with the apex below, from the posterior surface of the portio vaginalis (which is drawn forcibly downwards), and, after division of the posterior cervical wall, bends it over into the cervical canal, where it is fastened with several sutures to the cervical mucous membrane. Beneath this another lateral wedge-shaped incision is made in the manner described above. Kuester applies to this complicated operation the term "stomatoplastice uterina interna."

In patients who dread the knife Chrobak divided the lips of the cervix in the desired direction with an elastic ligature. He passed the ligature with a stout, sharply curved needle from the cervical canal out towards the fornix, and then tied it by passing both ends through a perforated lead ball. To avoid narrowing at the angle of the wound, he first passed a lead wire in some cases through the portio, and did not replace it with the elastic ligature until it became entirely imbedded, or he divided the underlying bridge of tissue with the galvano-cautery or thermo-cautery.

The field of operation is thoroughly disinfected before and after the operation. The hemorrhage usually ceases spontaneously or after compression with sponges or cotton tampons. Spirting vessels in the wound are tied. The majority of physicians still employ chloride of iron[1] and a cervical tampon, the later being also intended for the purpose of keeping the wound open. The actual cautery has also been employed to satisfy both indications, but it is apt to cause excessive retraction of the cicatrix, thus endangering the results of the operation. After the hemorrhage is checked several wads of cotton dipped in chloride of zinc (5 per cent) or iodoform and tied to silk threads are inserted into the cervical canal, where they are retained by means of a vaginal tampon.

The patient is carried from the operating table into bed, and remains there for a week.

AFTER-TREATMENT.—PROGNOSIS.

The main object of the after-treatment is to keep the cervical canal patulous and to prevent complete adhesion of the wound. On the third day the chloride of zinc wads are renewed, and this is then repeated every other day until cicatrization of the wound surfaces (third week after the operation.)

At the third or fourth change of dressing, the chloride of zinc may be replaced by salicylated cotton or iodoform gauze, in order to avoid a deep eschar of the mucous membrane. Such a dressing keeps the cervical canal open, exercises an antiseptic effect, and relieves any previously existing cervical catarrh. We have never observed fever or parametral irritation after their introduction, and the plastic results were always satisfactory.

After the third day Sims plugged the canal daily with glycerine tampons. Emmet prevents adhesion of the wound by the repeated insertion of the uterine sound. Greenhalgh introduced a tent with spring blades immediately after the operation. Priestley and Heywood Smith used special dilators. Other physicians employed hard rubber or glass tents, or suppositories of cacao butter, measures which, to say the least, interfere with strict antisepsis.

Hemorrhage is the principal annoying or dangerous accident during and after discission. It may occur during the operation when larger branches of the uterine artery are injured, particularly by too deep incisions at the level of the internal os and the insertion of the portio vaginalis. At other times it occurs as secondary hemorrhage after a shorter or longer interval. This is often the result of improper care, the operation being performed by the physician during his office hours, and the patient then being allowed to return home. Secondary hemorrhages also occur, at times, as the result of excessive cauterization by caustic antiseptics or the actual cautery, or of infectious diseases of the wound. Menstruation occurring soon after the operation may also prove dangerous. Hegar observed an extremely obstinate hemorrhage in a woman who, as it was discovered subsequently, belonged to a family of bleeders. The effective styptics at our command include, in addition to hot irrigations and firm tamponing of the canal (if necessary, with chloride of iron cotton), deep sutures around the cut surfaces, and, in very urgent cases, even closure of the os with sutures.

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[1] C. Braun bathes the portio vaginalis in liq. ferri. sesq.: others inject this fluid into the uterus. The majority insert tampons of linen or cotton, impregnated with chloride of iron, into the cervical canal.

The accidental injuries observed have been opening of the parametrium, the peritoneum and the ureter. The parametrium and ureter may be opened by deep incisions with improper instruments, when the infantile or atrophic organ is very small, or when there are cicatricial processes of retraction after previous parametral inflammation. In a case of injury to the ureter within our knowledge, the urine escaped through the vagina, but spontaneous recovery ensued.

Parametritis and peritonitis may result from external infection during the operation. But they are more frequently the result of self-infection, inasmuch as, after imperfect disinfection of the field of operation, the uterine and wound secretions, which collect behind the cervical tampons, undergo decomposition. Gonorrhœal endometritis is especially dangerous in this regard. Repeated manipulations of the wounded parts, such as are employed in checking secondary hemorrhage, are also very injurious.

The few reported cases of death from septic diseases occurred almost exclusively after the use of sponge tents, permanent introduction of tents, or repeated non-antiseptic tamponing of the vagina and cervix.

The plastic results of the operation are sometimes unsatisfactory. Excessive retraction of the cicatrix takes place around the newly formed os, or marked ectropium remains after too deep incisions. In the former event it is necessary to repeat the operation and to stitch the mucous membrane of the fissure; in the latter event the excessively divided parts must be partly reunited.

With proper indications, good technique and thorough antisepsis discission is a mild operation. Even before the introduction of strict antisepsis there were only one death from peritonitis, two dangerous hemorrhages and six cases of parametritis among 900 operations. At the present time danger is most apt to result from severe hemorrhage when hæmophilia or stasis in the pelvic veins is overlooked.

UNION OF OLD CERVICAL LACERATIONS.—HYSTERO-TRACHELORRHAPHY.—EMMET'S OPERATION.

In 1861 Roser recognized deep lateral lacerations of the cervix as the causes of ectropium of the lips of the os. But to Emmet belongs the credit of fully recognizing the etiological significance of these lesions and of recommending a plastic operation for their relief.

Cervical lacerations may be unilateral or bilateral; they either divide the lips of the cervix alone, or extend above the insertion of the portio into the walls of the supra-vaginal cervix. In the latter event the fissure passes into a parametral cicatrix, which may fix the cervix laterally, or even anteriorly or posteriorly in the pelvis. Unilateral fixation also causes torsion of the uterus, so that the laceration appears to be situated anteriorly or posteriorly. If the uterus is movable, it descends in consequence of the lesion and the lips of the cervix are everted on account of the traction of the vaginal insertion (Breisky's laceration-ectropium). After a time the lips are often flattened in such a way that the original appearance of the fissure entirely disappears, and the portio appears to be simply thickened.

The everted cervical mucosa with the folds of the arbor vitæ looks like an extensive erosion, on account of its irregularity and cherry red color. At the same time there is often marked prolapse of the vaginal walls and deep lacerations of the perineum. As the result of mechanical injuries and contact with infectious vaginal secretion, the gaping of the cervical canal gives rise to changes in the mucous membrane, to catarrh, the formation of retention-cysts, or even to cystic degeneration of the entire portio vaginalis. The everted cervical walls as high as the internal os may be strangulated by the great swelling and inflammation of the cystic mucosa, resulting in a condition similar to paraphinosis.

But if the cervix is fixed entirely or in part by parametral cicatricial bands, secondary displacements, especially retroflexions, often develop, and increase the morbid appearances at the cervix by their accompanying circulatory disturbances. Involution of the uterus is almost always delayed by deep lacerations of the cervix.

The symptoms complained of are only in part the direct results of the lesion. They depend in good part on the sequelæ of the lesion—for example, changes in position and disturbed involution of the uterus, traction and recurrent inflammatory processes in the parametritic cicatrices.

The most prominent symptoms consist of leucorrhœa, irregular hemorrhages, pains in the small of the back, a feeling of pressing downwards. Many complain of weakness and a sense of goneness in the abdomen. In others reflex neuroses occupy the foreground. These are dependent mainly on the textural anomalies and changes in position of the uterus; occasionally they are the direct result of constriction of the ends of the nerves in the cicatrix of the laceration.

Olshausen regards the lesion as a not infrequent cause of abortions, and Breisky believes that it may even favor the development of cancer.

It is evident that simple reunion of old cervical lacerations can not relieve all the morbid phenomena. Emmet himself recognizes this by the stress laid on the preparatory treatment, which may even last four months. The various affections of the mucous membrane are first relieved by hot-water injections, pessaries, scarifications, puncture of cysts, brushing with iodine, glycerine tampons. Emmet's followers in America were less critical, and regarded the operation as a panacea against the most varied conditions, and performed it without regard to all the possible forms and complications of the cervical laceration.

In Germany the operation is regarded as a very decided addition to our therapeutic measures, but more is not expected from it than it is really able to effect.

It is only in rare cases that the operation suffices to relieve all the symptoms. It is much more frequently merely a link in the chain of treatment, and in many cases, appears entirely superfluous, because the shallow lesion constitutes an insignificant complication.

We regard the operation as indicated in all deep lacerations with marked ectropium. The cervical mucosa must then be protected against further injury, and an increase of the ectropium prevented. The operation then relieves or diminishes catarrhal secretions and menstrual irregularities. If the changes in the mucous membrane are very advanced, the diseased mucous membrane is also excised (Schroeder), or the thickened lips of the cervix, which are infiltrated with cysts, are excised in a wedge-shape and only the highest parts of the laceration are united with sutures.

The operation is also useful in other directions.

If the uterus is movable, the annoying feeling of "weakness and goneness" in the abdomen is relieved, a result which is especially grateful to the patient.

If the laceration is complicated with retroflexion, Emmet's operation, in many cases, alone renders successful treatment with pessaries possible, because a suitable point of support for the posterior branch of an 8 pessary or Hodge's pessary was previously wanting.

The excision of cicatricial tissue in the angles of the laceration also acts favorably, in some cases, upon reflex symptoms. In Sutton's case the operation relieved epileptiform convulsions which had occurred very often, either spontaneously or on touching the angles of the fissure. In one of Kaltenbach's cases trigeminal neuralgia disappeared after the operation.

Spiegelberg's and Olshausen's cases have shown that the operation may remove the tendency to repeated abortions. Spiegelberg and Schultze sometimes observed a favorable effect on sterility acquired after the first childbed.

In complicating parametritis and sub-involution, a very considerable proportion of successful results is owing to the loss of blood and the subsequent rest in bed.

The greater the significance attached to old lacerations of the cervix, the more attention should be paid to union of the recent injury as recommended in 1878 by Kaltenbach. This operation sometimes saves life by checking hemorrhage, and also prevents the development of puerperal parametritis and subsequent anomalies of shape.

The technique of the operation is very simple. The vagina is exposed in the left lateral position; if the uterus is very low, in dorsal decubitus. Some operators prefer the knee-elbow position. If the lesion extends deeply into the parametrium, exposure is often rendered difficult by the fact that folds of the fornix protrude laterally, being drawn into the funnel-shaped edge of the fissure by contraction of the cicatrix.

Each lip is grasped in the middle with a tenaculum and drawn down.

By bringing the lips together we obtain a correct opinion concerning the amount of denudation necessary. This may be done with the knife or scissors, while an assistant secures the necessary traction of the parts by traction with the tenaculum. The denudation must include the entire lateral border of the lips of the cervix, but without extending too far into the lumen of the new cervical canal. The denudation may not be made too deep in the angles of the fornix on account of the large vessels in this locality. The shape of the future os and portio is greatly under our control by varying the shape and depth of the denudation. In paring angles which are accessible with difficulty, good services are afforded by long-handled knives curved on the flat; if scissors are used, the boundaries of the incision should first be made with the knife.

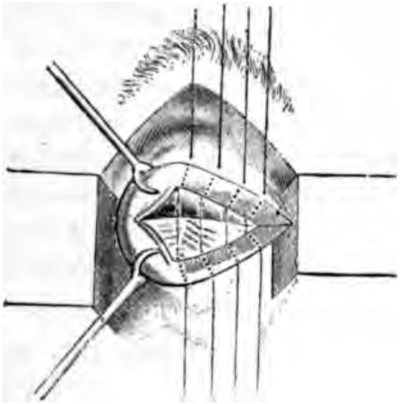
FIG. 174.

As a rule the hemorrhage is unimportant. Larger arteries occasionally bleed in the angles and must be closed at once with sutures.

Previous constriction of the cervix with a wire loop (Emmet) is as unnecessary as the use of prophylactic injections of hot water. If very much depends, in exceptional cases, upon the absolute saving of blood—for example, if the patient is very anæmic or a second operation, such as kolpoperineorrhaphy is to be performed forthwith—the edges of the fissure may first be grasped with long forceps. The smooth pared surfaces are then pierced on both sides over their entire width with curved needles; some prefer straight lancet-tipped needles. The wire or silk sutures are united towards the fornix. Three to five on a side are generally sufficient. Fig. 174 illustrates the mode of denudation and application of the sutures

After careful disinfection of the vagina a loose iodoform tampon is introduced and retained for a week.

The slightly painful operation may be performed without an anæsthetic; some physicians make it in their office. The sutures are removed in the second or third week after the operation. The patient is allowed to leave the bed on the eighth day. When performed under antiseptic precautions the operation is almost entirely devoid of danger. Parametritis sometimes results from imperfect disinfection or from strong traction on the uterus, if there are inflammatory processes in surrounding parts.

The plastic results in the vascular tissues which are free from tension are entirely assured. A repetition of the operation is rarely necessary, and it is in very few cases that small cervical fistulæ are left at the angles of the denuded parts. On the other hand excessive denudation may give rise to stenosis or even impermeability of the cervical canal.

Little is known concerning the course of subsequent parturitions. As a general thing the cicatrix seems to have remained firm; ruptures occasionally occurred in other parts. Jandrin is the only one who mentions impeded dilatation of the os, which was stenosed by the operation.

TEMPORARY CLOSURE OF THE OS UTERI.

Temporary closure of the os is sometimes performed, the lips of the cervix being united without previous denudation. Emmet first recommended this operation after imperfect reduction of old inversions, in order to retain the fundus until further reduction could be attempted at a second sitting. We thus secure the results already obtained, and, as in the use of the tampon, favor the occurrence of spontaneous reinversion.

Dangerous hemorrhages offer a second indication for temporary closure of the cervix. In a case of severe hemorrhage after discission, Hegar successfully adopted this plan. Freund carried out the same plan successfully in four cases of dangerous hemorrhage in fibromata, which could not be removed. In three patients he repeated the operation two, three and four times respectively without any bad effects. One patient died of a fresh hemorrhage at her home ten weeks after the second operation. In a woman aged forty years, the hemorrhages recurred now and then; in another of forty-five years, they ceased entirely. This method is said to present all the advantages of the tampon without its disadvantages.

In view of the small number of cases, a definite opinion cannot be given concerning the value of the operation, but it seems to be worth a trial, when the immediate checking of blood is imperative. The passage of blood into the tubes or abdominal cavity has not occurred hitherto. The removal of the sutures depends on the circumstances of the individual case, and upon the symptoms of stasis and decomposition of the blood accumulated in the uterus.

We will add the description of an operation performed by Martin for diminishing the hemorrhage and suppuration in cervical cancers, which cannot be excised. It consists in scraping and then uniting the walls of the cavity. Martin draws down the stump of the uterus and passes the needles from the border of the vaginal defect beneath the entire wound through to the stump. The mass of tissue constricted in this manner is completely closed by drawing vigorously on the sutures, and thus the edge of the internal os is united to the edge of the vaginal defect. If the mobility of the uterus is no longer entirely free, Martin stitches the part in such a way that the edges of the wound in the vagina are united in a horizontal direction with the stump. Before tying the sutures the entire wound surface is covered with iodoform. Any cavities which remain are stuffed with salicylated cotton. There is often considerable hemorrhage during the operation.

When the disease is further advanced, so that the rigid walls of the carcinoma are fixed immovably in the vagina, Martin stitches its deep crater from the vagina in such a way that a continuous line of firm sutures is situated on the anterior, posterior and lateral vaginal walls around the opening of the scraped crater. The first dressing is retained forty-eight hours and is replaced by a fresh tampon only when the hemorrhage continues. The patient remains eight to ten days in bed.

CHAPTER III.

OPERATIONS ON THE BROAD LIGAMENTS.

EXTIRPATION OF TUMORS OF THE BROAD LIGAMENTS.

BY far the most frequent tumors of the broad ligaments are cystic growths starting from the parovarium—parovarian cysts and cystomata. Solid tumors, fibro-myoma, sarcoma, are much rarer. They either develop primarily in the broad ligaments or they pass to the latter from the uterus as the result of constriction. The majority of parovarian cysts are unilocular, and contain a thin, clear serum, which is very poor in albumen. Conglomerate forms like proliferating ovarian cystoma are also found. The cysts may attain the size of a man's head or more. As a rule their walls are thin and translucent, rarely firm and tough. They are surrounded entirely by the peritoneum of the broad ligament, and form the most instructive examples for the study of the intra-ligamentary development of tumors. As they begin to develop in the angle between the ampulla and ovary, the broad ligament almost always is first unfolded at the lateral end of the tube, and this, often elongated to 20 to 30 cm., arches across the tumor, covered merely by peritoneum. The hilus of the extended ovary, which is often dragged to the side, is usually situated close to the tumor. All the previously described forms and degrees of unfolding of the broad ligaments are observed in parovarian tumors. On account of the predominant protrusion of one fold of the ligament, or marked growth in a lateral direction, parovarian tumors may acquire a pedicle-like connection with the pelvic organs despite their intra-ligamentary origin. The pedicle is formed exclusively by a reduplication of the peritoneum, or of this part combined with the lateral extremity of the tube and the ovary. The infundibulo-pelvic ligament does not pass to the lateral extremity of the ovary but more towards its middle, corresponding to the traction on the organ. The pedicle of parovarian tumors and sometimes the ovary may undergo torsion.

As a rule the tumor is loosely connected with the enveloping peritoneum and the cellular tissue of the broad ligament; even the vessels, supported by delicate bundles of connective tissue, enter the tumor at a great distance from one another. But there are also exceptions to this condition. The serous covering of the tumor is rarely adherent to adjacent parts of the parietal and visceral peritoneum. We have observed such a condition after a puerperal inflammatory process.

The symptoms of parovarian cysts are similar to those of ovarian tumors. They may become immediately dangerous to life from torsion of the pedicle or compression of an ureter.

It was formerly hoped that parovarian cysts with thin serous contents could be cured by simple puncture, and some successful cases have been reported. But the results are always uncertain. The fluid often reaccumulated or relapses occurred in adjacent, well-preserved tubules of the parovarium, so that extirpation was finally rendered necessary. In the majority of cases extirpation was decided on from the start, because the cyst was mistaken for an ovarian tumor

Pedunculated parovarian cysts are treated in the same way as pedunculated ovarian tumors.

As a rule, intra-ligamentary cysts are easily enucleated. After opening the abdominal cavity the tumor is seen to be completely covered by movable peritoneum, within which veins pass downwards in a meridional direction across the bluish or white translucent cyst wall. The broad insertion of the tumor and the folding of its coverings upon the abdominal walls are also visible.

After incision of the peritoneal covering the cyst is punctured, and it is then separated very easily from the ligament without hemorrhage by simple traction or with slight aid from blunt instruments. With the collapse of the tumor there is narrowing of the vessels which remain connected, in great part, with the capsular covering of the tumor. After complete removal of the tumor the folded peritoneal covering can often be ligated *in toto* as a pedicle, without leaving a cavity in the ligament.

If one or both folds of the ligaments are unfolded very deeply and widely the operation is performed as in enucleation of intra-ligamentary ovarian tumors, *i.e.*, the parametral wound surface is united, after shortening, if necessary, superfluous flaps of peritoneum. Drainage of intra-ligamentary sites through the vagina is rarely necessary, because the hemorrhage, as a rule, is insignificant and can be certainly checked by individual ligatures. This simple method renders the earlier complicated and dangerous methods entirely superfluous.

In some cases enucleation may be avoided by puncturing the tumor without incising the covering peritoneum. After complete evacuation of the cyst a sort of pedicle then forms from the collapsed ligament, and may be tied beneath the cyst wall with ligatures *en masse.*

If the sac wall is attached to surrounding parts with unusual firmness, we may be compelled to extirpate the cyst only in part and to stitch the remainder into the lower angle of the wound.

The ovary may often be left behind intact. As a rule it is not removed unless it has undergone pathological changes or forms a part of the pedicle, or unless the pelvic wound cannot be accurately closed without its removal.

The operative principles for the enucleation of firm tumors of the broad ligaments are the same as in solid intra-ligamentary tumors of ovarian or uterine origin.

Saenger has collected a number of older cases of operation, some of which are not sufficiently clear from an anatomical standpoint. On account of the improved methods of operation no inference can now be drawn from the previous unfavorable results.

Opening of Free, Intra-peritoneal Exudation.

Free, intra-peritoneal exudations, which are associated with a disease of the sexual organs, almost always sink into Douglas's sac. Inflammatory exudations, blood, ascitic fluid, and extravasated contents of ovarian cysts, etc., also gravitate into this part. Slight amounts of free exudation, in open communication with the abdominal cavity, do not form circumscribed tumors. We merely feel a doughy, soft, air-cushion-like swelling between the vagina and rectum, and can push its contents upwards towards the abdomen. Not until the exudation is very great, or if, in addition, a large tumor fills the abdominal cavity, does Douglas's sac bulge out towards the vagina or even in front of the external genitals, with or without prolapse of the uterus. In rare cases the anterior peritoneal fossa may also be pushed down, like a hernia, by fluids (Fig. 175).

In free inflammatory exudations there is either no indication for evacuation, or, if this does exist, there is hardly any favorable outlook for the evacuation. Benign exudations are rapidly absorbed or encapsulated. But if the exudation acquires septic properties, for example, after laparotomy, even evacuation and subsequent drainage of the abdominal cavity can hardly prevent the fatal termination. But the attempt must always be made, since nothing can be lost by the operation and everything may be gained. The technique of secondary drainage of the abdominal cavity is the same as that of primary drainage, except that the *lower* angle of the wound must first be opened by removing a few abdominal sutures.

Free hemorrhagic extravasations indicate operative interference only when, in extreme danger, the bleeding spot must be sought for, after opening the abdominal cavity, and must be closed by suture, acupressure, ligature, and, if necessary, even by extirpation of the bleeding, injured organ (burst tubal sac, punctured ovarian cyst).

Large ascitic effusions, which are the result of general circulatory disturbances or local irritation by ovarian tumors or multiple, subserous fibromata of the uterus, not infrequently give rise to marked protrusion of the anterior or posterior peritoneal fossa and even to complete prolapse of the uterus. If, for any reason, a radical operation may not be performed in such a case, the evacuation of the ascites may become necessary on account of the danger of suffocation, complete anuria or the impossibility of ingesting food. The anterior or posterior vaginal walls then form the best site of puncture, because they secure complete evacuation of the fluid with extremely slight injury to the tissues.

In the case illustrated in Fig. 175, Kaltenbach evacuated, on account of extreme dyspnœa, 10 litre ascitic fluid from the very prominent anterior peritoneal fossa, the uterus being completely prolapsed. The patient, *aet.* sixty years, who suffered from mitral insufficiency, recovered rapidly from her desperate condition, but died some weeks later from typhoid fever. No trace of ascites was found at the autopsy.

If Douglas's sac is protruded by extravasated tumor contents the therapeutic value of evacuation falls into the background when compared with its diagnostic value. For, even if the discharge of a considerable amount of fluid tumor contents, plus ascitic or inflammatory transudation, relieves the patient, this is only temporary if the tumor is not removed. Extremely valuable, on the other hand, are the diagnostic data obtained concerning the condition of the peritoneum and the histological character of the tumor, data which may be decisive concerning the advisability or urgency of further operative interference. Even the connections of the tumor with the pelvic organs may be recognized by the introduction of the finger into the wound.

The projecting Douglas's sac is opened by a short incision. A trocar will push forward the firm but not sufficiently tense vaginal wall, instead of perforating it. Nor is the matter bettered by the fixation of folds of the vagina or the use of narrower canulæ, inasmuch as the latter are easily occluded, and may pass between the peritoneum and vagina, instead of into the abdominal cavity. If the tumor contents are tough and gelatinous the incision must be several centimetres in length. After slow evacuation the incision is closed by deep sutures including the peritoneum, and the abdomen is compressed by a cotton bandage.

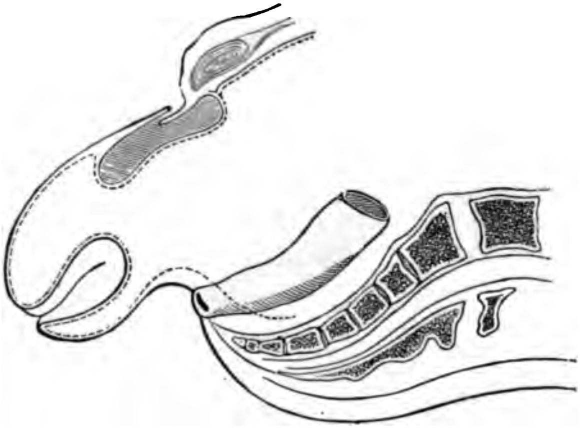

FIG. 173.

OPENING OF ENCAPSULATED INTRA-PERITONEAL EXUDATIONS.

1. *Inflammatory Exudations.—Abscesses in Douglas's Sac.*

Inflammatory exudations which do not run a rapidly fatal course, attended with septic phenomena, are soon encapsulated by bridging false membranes between the fundus of the uterus and rectum or by a roof of adherent loops of intestines. They then form tense elastic, distinctly fluctuating tumors between the rectum and vagina. Very large exudations may extend above the uterus to the anterior abdominal wall, despite encapsulation. An exudation in Douglas's sac often communicates by a larger or smaller opening with higher intra-abdominal, encapsulated foci between the loops of intestines, or there may be a combination of intra-peritoneal and extra-peritoneal (parametritic) abscesses.

The indications for opening encapsulated exudations are high fever, and symptoms of septic poisoning, when the abscess can certainly be reached through the vagina or abdominal walls. In all other cases it is better to wait for absorption or spontaneous discharge to the outside or into the rectum.

The vagina is almost always the site of puncture. The possibility of the entrance of intestinal gases and fæces into the abscess cavity contra-indicates puncture through the rectum. That this does not happen after spontaneous rupture into the rectum is explained by the oblique or winding course of the canal of perforation, which secures a valve-like closure against the intestinal lumen. We have repeatedly found that the thin wall of the abscess in the direction of the rectum yielded to the pressure of the exploring finger.

If there is any doubt concerning the character, amount, and exact situation of the exudation, an exploratory puncture is first performed or fluid is withdrawn with Dieulafoy's apparatus. If the purulent or ichorous character of the exudation is thus ascertained, the opening must be sufficiently enlarged to secure permanent free escape of the secretion. In puncture with the trocar, the exudation is grasped between the index finger in the rectum and the thumb in the vagina. The tension of the sac contents is thus increased and the direction of the trocar, which is passed along the thumb, may be better controlled. To avoid excessive resistance during perforation, we use trocars of a moderate size and subsequently dilate the opening with a sound or a narrow blunt-pointed bistoury.

When Douglas's sac is lowered very much, it is incised in layers after exposure of the vagina. Kaltenbach opened, two months after childbirth, a large intra-peritoneal abscess which had pressed the posterior vaginal wall close against the symphysis, and had produced retention of urine by compression and traction of the urinary passages. More than a pint of pus was evacuated, and the thickened peritoneum was distinctly visible in the cut surface. After the evacuation is complete, the cavity is irrigated under slight pressure or, better still, is thoroughly disinfected by washing, and then drained with iodoform gauze. In one case (Fig. 176) Spencer Wells drew a drainage tube through a second opening in the vagina.

In very high abscesses or exudations situated alongside the abdominal walls it is also possible to make an opening through the abdominal walls, above Poupart's ligament or in the linea alba. In some cases puncture and drainage of the abdominal walls and vagina may be performed at the same time.

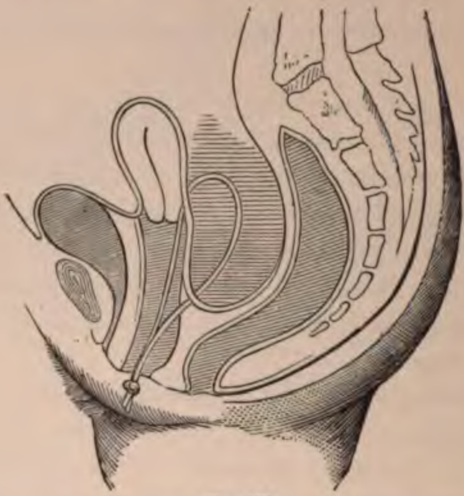

FIG. 176.

Thus, in an intra-peritoneal abscess, composed of several pockets, Hegar first opened a pus cavity encapsulated between the intestines by an incision in the linea alba, from here hunted for the communication with the pelvic segment of the abscess in Douglas's sac, and then drained the entire cavity through the vagina and abdominal walls. Recovery occurred after antiseptic irrigations lasting several weeks.

Kaltenbach observed a very large intra-peritoneal exudation, the product of a chronic serofibrinous peritonitis. It developed slowly after the second childbed, and formed a large fluctuating tumor, whose upper limit of dullness extended a hand's breadth above the umbilicus. As a tympanitic percussion sound was heard in both lumbar regions, the sac was regarded as an ovarian cyst. Incision as long as the width of the hand in the linea alba; great vascularity of the abdominal walls; very thick peritoneum, so that even after it was opened and a greenish yellow viscid fluid escaped, the diagnosis of a totally adherent cyst was not readily excluded. The sac was bounded inferiorly by the adherent pelvic organs, above and laterally by adherent loops of intestines. This cavity, containing 5 litres, was drained towards the vagina and both lumbar regions, tubes being drawn through in these directions by the aid of a thick trocar perforating from within downwards. After antiseptic irrigations for two months, the sac shrunk to a small fistula in the linea alba, which hardly secreted at the end of six months. The patient recovered strength at Baden-Baden, but died of phthisis 2½ years later.

2. *Encapsulated Hemorrhagic Effusions.—Retro-uterine Hæmatocele.*

Hemorrhagic effusions, if they do not prove rapidly fatal, also become encapsulated in Douglas's sac and sometimes even beyond it. They sometimes occur into a space already bridged by false membranes.

The opening of a retro-uterine hæmatocele is indicated very rarely, when suppuration or gangrene of the sac occurs as the result of improper therapeutic measures, or if violent pains and severe symptoms of compression of the pelvic organs demand relief. Finally, puncture may become necessary if absorption does not occur, despite the long duration of the disease, while the tumor produces pains and mechanical disturbances or becomes the site of recurrent inflammations.

The technique and after-treatment are the same as in puncture of inflammatory exudations.

In old hemorrhages the thickened peritoneum and fibrinous masses must be penetrated in layers until the central fluid blood is reached. Zweifel punctures in two sittings, at first the vaginal walls and, later, the callous capsule after the hemorrhage is entirely checked.

THE OPENING OF EXTRA-PERITONEAL EFFUSIONS.

1. *Parametritic Abscesses.*

Outside of childbed extra-peritoneal abscesses develop only after operations of the cervix, improper orthopædic treatment or forced dilatation. Infection always plays a part in the process.

In accordance with the causation the abscesses are situated either at the side of the uterus within the folds of the broad ligament or inferiorly in the cellullar tissue between the floor of Douglas's sac and the adjacent parts of the rectum and vagina. Non-puerperal abscesses rarely attain such a size that they unfold the layers of the broad ligament over a large area or extend to the iliac fossa. But sometimes the peritoneum is separated widely from the base of the broad ligaments by a large accumulation of pus and the latter extends along the anterior abdominal wall to the level of the umbilicus or along the extra-peritoneal cellular tissue into the lumbar region. Inferiorly the pus extends occasionally into the para-vaginal cellular tissue.

The question of puncture need not be considered until the pus can be reached with certainty. Its evacuation checks the fever and prevents further destruction and undermining of the pelvic cellular tissue and the enclosed or adjacent organs.

The site of the opening is determined by the position of the abscess. It is performed almost exclusively in the inguinal region above or below Poupart's ligament, and in the vagina.

But if the pus burrows in the lumbar region, it may be necessary to make the opening in this region by dissecting layer by layer along the lateral border of the quadratus lumborum.

The incision is made above Poupart's ligament when the abscess is situated close to the anterior abdominal wall. It is made parallel to and immediately above Poupart's ligament, as the peritoneum passes only a little above the inguinal fold. The exact choice of position depends generally on the contours of the tumor as shown by palpation and percussion. The more the abscess approaches the spine of the ilium the more the incision is made to the side. As a matter of course due attention must be paid to the thickness of the integument and to its possible adhesion to the abscess wall. The first incision (about 6 cm. in length) divides the skin and subcutaneous adipose tissue, and only small veins or the superficial epigastric artery are wounded. We then pass in carefully, layer by layer, with the bistoury and grooved director, dividing successively the aponeurosis of the external oblique, the fibres of the internal oblique and transverse muscles, and finally the transverse fascia. If the abscess is not reached, the passage to the pus is made by boring or scraping movements with the grooved director, and, after the pus appears, the opening is enlarged with a blunt-pointed knife or by blunt dilatation. If spontaneous rupture is indicated by thinning, redness and immobility of the skin, an incision is made directly into the part. If the sac is large or incompletely evacuated it must be drained with a glass tube or iodoform gauze.

Puncture below Poupart's ligament was recommended particularly by

Roser when the pus had passed spontaneously along the vessels through the femoral ring. The lower border of Poupart's ligament is exposed, the fascia of the thigh also divided in this locality, and a passage to the abscess then made on the outer side of the artery with a volsella, grooved director or other blunt instrument. As soon as the pus flows, the opening is dilated with the blades of a volsella or with the fingers.

Hegar has recently described two methods of reaching deep pelvic abscesses in a much less dangerous way than formerly. This may be done through the abdomen or the floor of the pelvis without injury to the peritoneum. If an incision is made along the median part of Poupart's ligament and then dissected down to the peritoneum, we may follow the outer surface of the latter with the finger along the horizontal ramus of the pubis. Along the bladder we reach the pelvis, the fold of peritoneum which passes from the broad ligament to the anterior wall of the pelvis being lifted up. The finger is thus passed easily beneath the base of the broad ligament, and from thence, with equal facility, beneath the layer of peritoneum which, covering the posterior and lateral parts of the pelvis, passes from the broad ligament to the posterior wall of the pelvis. This incision along Poupart's ligament and lifting up of the peritoneum may be employed without great difficulty in pelvic abscesses, even if the pus is accumulated beneath the posterior fold of the broad ligament. But this method should not be employed in abscesses of long duration, or if severe and prolonged peritonitis has occurred, inasmuch as the peritoneum then becomes very firmly attached to its underlying parts and is more apt to be torn than separated from the subserous cellular tissue.

The other plan is that of puncture through the ischio-rectal fossa. This is free from the danger of opening the abdominal cavity, even if peritonitis has occurred, and may be adopted in old, thick-walled abscesses, though only when they are situated beneath the posterior fold of the broad ligament. After dividing the integument and superficial fasciæ by an incision from the tuber ischii to the top of the coccyx, a passage can be made with the fingers to the lower outer surface of the levator ani. The middle and inferior hemorrhoidal branches of the pudendal artery can alone be injured and these vessels are easily tied. The upper surface of the levator ani can also be exposed freely with the fingers. The thin layer of muscular fibres and the delicate pelvic fascia are divided with blunt instruments, and we are then in immediate contact with the abscess.[1]

2. *Extra-peritoneal Hæmatoma.—Peri-uterine Hæmatoma.*

Hemorrhages into the broad ligament spread most frequently in such a way that the posterior layer is protruded backward and to the side. The uterus is pushed to the opposite side. The peritoneum on the posterior surface of the uterus is often separated over a large area, and bilateral hæmatomata are sometimes connected by a narrow bridge on the posterior wall of the cervix. Inferiorly these hemorrhages are bounded by the pelvic diaphragm, superiorly by the ovarian ligament, so that the upper part of the broad ligament is not unfolded.

Expectant treatment should first be adopted. Interference is only required at a later period, when signs of decomposition appear, or when rupture is threatening or has occurred as the result of secondary changes in the peritoneum. Finally, puncture is indicated if absorption does not occur, if the extravasation has lasted for months and gives rise to severe symptoms.

The vagina is the most favorable site for opening extra-peritoneal hæmatomata. As the contents of the blood sac consist, in great part, of clots of fibrin, an incision 2 to 3 cm. long is necessary for the evacuation of these masses. After incision of the vaginal wall and checking the hemorrhage, perforation with the finger or grooved director, dilatation of the opening with the volsella or blunt-pointed bistoury, then evacuation of whatever is easily removed. Forced evacuation is dangerous, as it may give rise to rupture of the sac wall or to renewed hemorrhages.

Washing the sac with sponges dipped in corrosive sublimate, and the introduction of iodoform gauze, secure antisepsis better than the use of a glass tube and frequent irrigations.

The second way of reaching an extra-peritoneal extravasation leads through the abdominal cavity.

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[1] Hegar even opened an intra-peritoneal abscess following gonorrhœal salpingitis, through the ischio-rectal fossa. After dividing the pelvic diaphragm, a passage must be made through the sub-peritoneal space, which is 1½ to 2 cm. high, before reaching the peritoneum. The large vessels of the pelvis and ureter are situated in the lateral part of this portion of the sub-peritoneal space, so that we must keep towards the middle, near the rectum.

Baumgaertner performed laparotomy, incised the apex of the blood sac and drained through the vagina, while the edges of the peritoneal opening were stitched to the abdominal wound. Recovery.

Martin performed laparotomy eight times in peri-uterine hæmatoma, with two fatal results. Incision and evacuation of the sac with the fingers and spoon. Passage of a thick drainage tube, by means of a volsella, into the vagina. Intestinal adhesions to the tumor are not to be separated entirely. Hemorrhages from the sac wall or side of the uterus are checked by ligature or stitching the sac wall to the uterus. Then stitching of the sac towards the abdominal cavity. If this is impossible on account of the brittleness of the walls, the latter and the intestines are simply placed on the drainage tube, and the abdominal cavity closed. In two cases the ovary and tube, in one an hæmatosalpinx, were also removed.

Despite the relatively good results, we regard laparotomy as justified in exceptional cases alone, such as rupture or when there are ovarian and tubal complications.

Martin recognizes very broad indications; in one case the hæmatoma was only as large as a fist. He claims that his method permits complete evacuation of the sac and very complete hæmostasis, if hemorrhage from the sac wall takes place; but it must be remembered that the opening of the abdominal cavity exposes the patient to the danger of infection from extravasated contents of the tumor, the character of which cannot be foretold with certainty. The peritoneum is cut twice to reach an extraperitoneal sac, which can be reached through the vagina in a much less dangerous way without opening the abdominal cavity.

Zweifel states that the mortality is ten per cent. when vaginal incisions are made, while it was twenty-two per cent. in the nine laparotomies of Baumgaertner and Martin.

OPERATIVE TREATMENT OF ECHINOCOCCUS OF THE PELVIC CAVITY.

The anatomical distribution and treatment of echinococcus of the pelvis are very similar to those of parametral effusions and hæmatomata. We have seen but one case of the disease, and therefore follow Freund's description.

The echinococcus enters the pelvis primarily as an embryo, or secondarily as the developed animal by migration from organs situated higher in the abdomen. Primarily it always appears in the subserous cellular tissue, at first in the posterior part of the pelvis to the side of the rectum, and in the mesocolon, finally in the bones, particularly the sacrum and pubis. The parasite wanders along the cellular tissue and enters the parametrium, paracystion and the iliac fossa. It leaves the pelvis through the greater sciatic foramen, the foramen ovale or along the femoral canal; inferiorly it distends the levator ani to the perineum; superiorly it extends beneath the anterior parietal layer of the peritoneum. In the vicinity of the echinococcus the cellular tissue is in a condition of chronic inflammation and the blood-vessels are dilated. The pelvic viscera are displaced; the rectum, uterus, bladder, vagina, abdominal and pelvic walls may be perforated, usually after suppuration or gangrene of the sac. The thickened pelvic peritoneum, on the other hand, remains intact.

The echinococcus is recognized by the peculiar results of palpation and its situation. Infection is apt to follow exploratory puncture, particularly through the rectum. Freund observed two deaths in such cases.

The treatment consists in free incision and evacuation of the cyst. This may be done in the inguinal region as in parametritic abscesses. In one case in which the echinococcus sac not alone unfolded the broad ligament above the inguinal fold, but also extended along the femoral canal downwards beneath Poupart's ligament, Hegar opened the sac from both sides and inserted a drainage tube. Severe hemorrhage from the vascular networks around the vesicles. Recovery after disinfectant irrigations lasting several months.

If the tumor has grown considerably into the abdominal cavity, laparatomy is performed and the sac enucleated like an intra-ligamentary ovarian tumor. This plan guarantees the greatest cleanliness, and certainty of completing the operation. If the connection of the parasite with the uterus has become indissoluble from the proliferation of the vesicles into its walls, it may become necessary to perform supra-vaginal amputation of the uterus and removal of all the appendages.

If enucleation cannot be performed completely after laparotomy, the opening in the tumor must be stitched to the abdominal opening, and the cavity treated by temporary plugging or drainage.

If the parasite has not grown above the superior strait of the pelvis, a long incision into the sac must be made through the posterior or lateral fornix of the vagina.

OPERATIONS IN HYDROCELE MULIEBRIS.

Cystic or sacculated hydrocele in the female arises from an accumulation of fluid in Nuck's canal, which has been only partly closed on account of anomalous involution. If it is obliterated only in the region of the internal inguinal ring, the hydrocele fills the entire inguinal canal as an elongated tumor as large as an egg, and even extends into the labium. The round ligament runs along the posterior or inner wall of the cyst as a whitish or pale red band. If the vaginal process of the peritoneum is obliterated in several places, two or more cysts are produced, separated by constrictions.

In some cases the cysts are not situated upon but in the round ligament. Their walls are then formed by the separated fibres of the round ligament, whose continuity appears to be broken by the cysts.

Hydroceles communicating freely with the abdominal cavity are hardly ever the object of surgical treatment, since the secretion and re-accumulation of fluid do not depend on local causes alone.

The two varieties of cysts first described require surgical interference only when they become annoying on account of their size and produce pain, or when they become inflamed or the site of hemorrhages.

The same operations are at our command as in hydrocele of the male, *viz.*, puncture, injection of iodine and incision. Hening cured a cyst 10 cm. long and 6 cm. broad by drawing a double iron wire through it. Puncture and injection of iodine were often successful, but relapses sometimes occurred or suppuration necessitated subsequent incisions. Incision followed by an antiseptic tampon is the most certain means of cure, especially if the incised peritoneum or edges of the cyst are stitched to the integument. Inflamed hydroceles may simulate incarcerated intestinal or omental hernia to a remarkable degree, because they are associated not infrequently with irritative symptoms on the part of the adjacent peritoneum. In three cases reported by Chiari a cure was effected by simple incision which gave vent to pus or ichor. Chassaignac and Pitha have observed inflammation and suppuration outside of the sac.

CHAPTER V.

OPERATIONS ON THE VAGINA.

OPERATIVE PROCEDURES IN GYNATRESIÆ

ANATOMY OF GYNATRESIÆ.

ATRESIÆ of the female genital tract, whether they affect the hymen, vagina or uterus, are so much alike in their sequelæ, indications for operations and dangers, that their strict separation from a topographical standpoint would lead to useless repetition. We will therefore discuss all forms in the present section.[1]

I. *Atresiæ in a simple Utero-vaginal Canal.*

Atresia of the hymen has been known for the longest period. Imperforate hymen is generally characterized by great toughness and firmness.

Atresiæ of the vagina depend, in the majority of cases, on errors of development. The entire vaginal portion of Mueller's strand may be absent, so that the bladder and rectum are separated merely by a thin layer of cellular tissue. In other cases this part of Mueller's duct is present, but is occluded for a longer or shorter distance. There are all possible gradations from simple membranous closure to long and even total atresia. In the latter the vagina appears to be converted into a solid strand, and the uterus is usually atrophied. The site of atresia also varies, but broad atresiæ are much more frequent in the lower part of the vagina.

Acquired adhesions of the vagina are the result of puerperal pressure-necrosis and other injuries (rape), caustic injections, cauterization or various infectious ulcerative processes. On the whole they are rare.

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[1] Absence or closure of the vestibule and the cellular atresia of the vulva will be discussed separately, because they present special characteristics.

The vagina, in such cases, is usually infiltrated with cicatricial masses, and narrowed for some distance from the point of atresia.

Acquired atresiæ of the uterus are more frequent than the congenital forms. Those cases are especially rare in which congenital atresia of the uterus is isolated, without other developmental anomalies of the sexual apparatus. The occlusion is either due to the fact that the mucous membrane of the portio vaginalis passes without a break from one lip of the cervix to the other, or the entire cervix is imperforate and the portio vaginalis poorly developed.

Congenital obliterations may occupy the external or internal os, with a longer or shorter adjacent part of the cervical canal. Occlusion of the external os is the result of pressure-necrosis, adhesion of the ulcerated surfaces, or of the amputated or ulcerated cervical stump to the adjacent fornix. In very extensive puerperal necrosis the adhesion usually involves the adjacent fornix (utero-vaginal atresia).

Adhesions of the internal os are found chiefly in old individuals as the result of catarrhal endometritis with loss of epithelium. In addition to senile involution a favoring factor in such cases is the presence of a flexion, which brings the opposing ulcerated surfaces in close contact.

In rare cases multiple atresiæ have been observed—for example, two vaginal atresiæ (Thompson), occlusion of the hymen and vagina (Steiner), uterus and vagina (Dupuytren, Amussat and Huguier). An accumulation of vaginal secretion was usually found between the different atresiæ.

II. *Unilateral Atresiæ in Reduplication of the Utero-vaginal Canal.*

In all carefully described cases of double utero-vaginal canal the occlusion was always unilateral;[1] it occurred much more frequently on the right side and affected either the uterus or the vagina. In this anomaly a defective development, a persisting solidity of one of Mueller's strands, is associated with incomplete coalescence of the utero-vaginal canal over this part.

Unilateral occlusion of one half of the uterus is very rare. Among forty-six cases of unilateral atresia collected by Breisky thirty-five affected the vagina, eleven the uterus.

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[1] Breisky mentions one case by Neudorfer, in which the history renders the existence of a bilateral adhesion probable.

and the opening enlarged with the knife. The patient died of peritonitis eight days later. Since 1834 more than fifty cases of unilateral occlusion of the vagina have been reported. It may be the result of an imperforate hymen, but the occlusion is usually situated higher, in the middle of the vagina or the fornix. If retention of secretion occurs the vagina may assume a cylindrical, sausage shape, or form a fluctuating or elastic tumor of a club shape inferiorly and may fill almost the entire pelvis. In many cases the open and closed utero-vaginal canal is not simply in apposition, but a spiral crossing is observed, the lower portion of the blood sac being situated in front of, the upper portion behind, the open utero-vaginal canal. If the distension is excessive the blood sac shines through as a bluish cyst; above it passes into the tumor formed by the uterus and is sometimes separated from it by a sharply circumscribed, circular defect, which can be felt through the open vagina. The portio vaginalis of the open side has a very eccentric position; its external orifice forms a semilunar longitudinal slit, with the concavity directed towards the distended horn of the uterus (Fig. 176.) The uterus is bicornis, more rarely bilocular (Fig. 178). The blood sac sometimes perforates into the open vaginal or uterine cavity or externally into the paravaginal cellular tissue, and the blood may burrow into the buttocks.

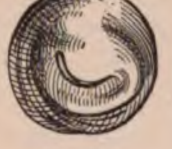

FIG. 177.

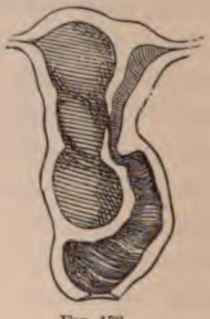

FIG. 178.

Sequelæ of gynatresiæ.—Congenital gynatresiæ give rise to retention of menstrual blood from the beginning of the period of puberty. The genital canal above the occlusion is dilated by the accumulated blood, which may amount to several pounds. According to the site of obliteration the uterus alone may take part in the formation of the blood sac (hæmatometra), particularly the cervix, or the vagina may also be involved (hæmatokolpos). After a long time the blood generally accumulates in the tubes (hæmatosalpinx). The tube then forms a series of two, three or four distinct blood sacs which are separated in part by lamellæ which project internally, in part by externally constricting, peritonitic false membranes and bands. The ends of the tube are almost always closed. If the abdominal end remains open or yields temporarily to the accumulated blood, the latter may pass into the abdominal cavity and, in favorable cases, is encapsulated in Douglas's sac (retro-uterine hæmatocele) or between the fimbriated extremity of the tube and the ovary. Hæmatosalpinx and the pelvic peritonitis which accompanies every retention of blood in the internal sexual organs are of great practical importance and exert a very great influence on the results of operation.

The retained blood has the well known tarry color and consistence, but may assume a puruloid character from the admixture of inflammatory products.

Catarrhal secretions are also retained occasionally in gynatresiæ. In rare cases distension of the uterus or vagina with a mucoid fluid has been observed during childhood, but has rarely required operative interference.[1] In exceptional cases a sero-mucous fluid accumulates during puberty, instead of blood. Thus, in a girl aet. eighteen years, Bryk found 1½ litre inspissated mucus behind the occluded vagina in the hourglass-shaped uterus. Unilateral retention sacs of this kind have also been observed. In a multipara aet. thirty-eight years Breisky found hydrometra lateralis as the result of congenital occlusion of a rudimentary vagina in uterus duplex. Smolsky and Kleinwaechter have reported pyokolpos unilateralis. But large accumulations of catarrhal secretion are found most frequently in the atresiæ acquired at the menopause. If the internal os alone is closed, the uterine cavity alone is dilated; if the internal and external orifices are both closed, hour glass-shaped tumors are formed. So-called physometra may result from intermittent entrance of air or the spontaneous development of gases of decomposition.

Unilateral atresia is sometimes followed by perforation of the retention sac towards the open side (Fig. 178). This is apt to be followed by decomposition of the partially stagnant secretion, which cannot escape freely through the unfavorably situated or very narrow perforation.

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[1] Godefroy observed in a child aet. two months, interference with micturition and defecation resulting from accumulation of mucus behind the imperforate hymen. Hirschsprung reports two similar cases in children aet. five and sixteen months.

Transitory adhesions of the os following corroding secretions, cauterization or the use of the actual cautery, sometimes give rise to the retention of large amounts of extremely foul-smelling ichor.

INDICATIONS.

The dangers and sequelæ caused by retention of uterine secretions or menstrual blood constitute the main indication for surgical interference. The patients suffer most from the violent paroxysms of pain, which occur at first only during menstruation, but later after the advent of inflammatory processes, also during the intervals. According to its size and position the tumor also produces various symptoms of compression and mechanical disturbances. At the same time the patient is always in danger of peritonitis or rupture of the retention sac.

Our object is not alone to produce a single evacuation of the retained fluids, but also to form a permanent passsage for the uterine secretions.

A minor object in atresia of the hymen or vagina is to render cohabitation and conception possible. The latter, indeed, is undesirable in some of the developmental anomalies observed in such cases, and some physicians advise that only a small opening be made, so that while the escape of menstrual blood becomes possible, conception will be rendered difficult by interfering with the entrance of the penis. But according to the experience of Hyeonaux and others, who observed the occurrence of conception even when the opening was very narrow, such a hope is fruitless. Whether the opening of a broad or total atresia of the vagina is justified by difficulty in cohabitation alone, although a retention tumor or well-developed uterus is not demonstrable, is extremely questionable. In the first place the technical difficulties and the dangers of the operation are much greater, and on the other hand the artificially formed vagina would be of but little value if the uterus was in a rudimentary condition.

Fletcher appears to be the only one who has successfully made an artificial vagina, in a case in which there was no retention. A married woman, aet. twenty-two years, had a completely occluded vagina; the urethra was markedly dilated by the attempts at cohabitation. The menses appeared soon after the operation, and shortly afterwards the woman became pregnant.

As gynatresiæ usually become noticeable only when sexual intercourse thickness of the intervening layer and thus to avoid injury to these viscera. With a broad scalpel the vault of the vestibule or the rudimentary vagina is now cut in a transverse direction, midway between the urethra and rectum. Into this wound we insert a finger or spatula-shaped instrument, and endeavor to make our way laterally between the bladder and rectum, through the occluded portion. The vaginal depressors and tenacula are then introduced more deeply, corresponding to the amount of space gained. Firm, band-like masses of tissue are divided by short incisions with the knife or scissors If we have thus made our way, partly with blunt, partly with cutting instruments, to the neighborhood of the blood sac (as is ascertained most readily by rectal exploration), a trocar may be pushed in the direction of the fluctuating spot, and the opening cautiously enlarged laterally on a grooved director. The region of the os is sometimes felt through the final occluded portion of the vagina as a round, soft spot. Breisky uses, for puncture, a long-handled, lancet-shaped knife, which, concealed in a canula, can be protruded, and, at the same time, employed for lateral dilatation of the puncture.

The broader the atresia and the less the adjacent organs are separated by the blood sac, the more apt are the bladder, rectum, peritoneum or ureters to be injured accidentally. In some cases even the most skillful surgeons have abandoned the operation as too dangerous.

Amussat attempted division of the occluded vagina by blunt instruments. He first pushed a catheter behind the urethral meatus against the closed vagina, and then bored his way further between the bladder and rectum with the tips of the fingers. This canal was dilated with the fingers in subsequent sittings. Amussat also inserted sponge tents in the intervals, and thus often a week elapsed before he reached the blood sac. The latter was then opened with a trocar.

The exclusive use of cutting instruments, which are apt to give rise to accidental injuries and annoying hemorrhages, is hardly ever resorted to at the present time. The majority of recent operators adopt Amussat's method of blunt division to a greater or less extent, but complete the operation, if possible, in one sitting.

On account of the difficulty and danger of the formation of an artificial vagina, Dubois and Boeger recommended puncture of the blood sac through the rectum. At first this was usually intended to produce a permanent utero-rectal fistula. The puncture, therefore, was often repeated several times (Oldham), or the opening was prevented from closing by the permanent insertion of the canula of the trocar (Baker Brown). The formation of a permanent fistula appears, from the cases heretofore observed, to be attended with considerable difficulty, and always necessitates a wide opening into the blood sac. This is always dangerous on account of the possible entrance of fæces or gas. At the most the only reason for puncture through the rectum is the security it affords against the occurrence of conception.

The recent advocates of rectal puncture regard the operation merely as a preliminary to the formation of an artificial vagina, which is performed later, after the danger of rupture has passed. In this manner Greenhalgh has recently obtained four successful results. The only objection to be offered to this plan consists in the fact that the absence of the blood sac interferes considerably, in the subsequent formation of a vagina, with our appreciation of the topographical relations.

Despite these objections single puncture through the rectum with narrow instruments usually appears to have been well tolerated. Symptoms of peritonitis developed only in exceptional cases. This is explained by the oblique direction of the perforation and the frequency of adhesions in Douglas's sac. In one case Baker Brown injured the bladder during rectal puncture.

Simon's proposition to open, from the bladder, blood sacs which are accessible with difficulty on account of broad vaginal atresia, is well worthy of consideration. This method prevents injury to the peritoneum and the entrance of gases, and the menses may escape in the urine if the communication remains open.

3. *Opening of Atresiæ of the Uterus in a Single Genital Tract.*

Occlusions of the external os are opened by the puncture of a trocar, long-handled knife or blunt scissors, after exposure and fixation of the field of operation. The obturating membrane is rarely very broad, and hence accidental injuries are not apt to occur. Simple epithelial adhesions of the os or adhesions of the cervical stump to the fornix may be divided with a sound.

Acquired obliterations of the internal os generally yield to the pressure of an uterine sound, or they yield spontaneously after the introduction o a sponge tent into the lower patent part of the canal. But this does not complete the cure in hydrometra, inasmuch as the causal catarrhal endometritis must be relieved by cauterization of the uterine cavity, and readhesion prevented by the introduction of hard rubber tents, etc.

4. *Opening of Unilateral Hæmatometra in Double Uterus with equal development of both halves.*

In all the cases which have been accurately described (whether an operation was performed or not) it is expressly stated that the cervix of the occluded horn was especially distended with blood, and that the blood sac projected distinctly into the corresponding fornix or towards the open cervical canal. Puncture is therefore easily made with the knife or trocar through the vagina or open cervical canal. In Crede's case the introduction of the uterine sound caused perforation of the occluded right half into the cervical canal of the left open horn. Holst opened the blood sac with a trocar through the eccentrically situated os of the open side. Jones first made an exploratory puncture and then an incision through the vagina. Olshausen effected complete recovery by two punctures; the sac did not fill again, and the patient became pregnant three times. Slaviansky performed partial laparo-hysterectomy in unilateral hydromelia and uterus bicornus duplex; recovery.

5. *Opening of Hæmatometra in the Rudiment of a Uterus Unicornis.*

No general principles can be laid down with regard to the best method of treatment in this condition. Moreover, no *post-mortem* examinations have been made concerning the anatomical relations of these retention-sacs to surrounding parts, particularly to the peritoneum. The methods recommended are expectant treatment, simple puncture, formation of a permanent fistula, and extirpation of the sac. In Hegar's two cases he attempted to establish a permanent fistula in the fornix, after adhesion of the latter to the sac had been secured by cauterization with Vienna caustic paste. There was no marked reaccumulation during the time that the patients were under observation, so that puncture (which had evacuated ¼ litre tarry blood) and the introduction of canulæ were not repeated.

Opening of Unilateral Closure of the Vagina in Double Vagina (Hæmelytrometra or Hæmatometra and Hæmatokolpos Lateralis.)

The blood sac in the occluded half is readily accessible to instruments, because it projects strongly towards the open vaginal lumen and usually extends deeply towards the introitus. It is generally punctured with the knife or trocar, and the opening is then enlarged with the scissors. This was done successfully in Hegar's case. Fig. 179 shows the gaping incision, surrounded by thickened edges, in the obturating septum.

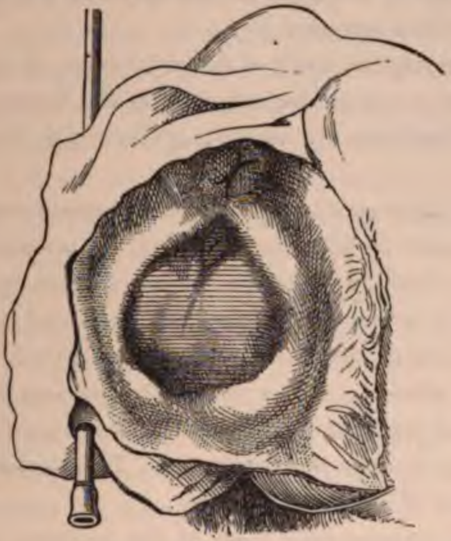

Fig. 179.

Veit and Schroeder recommended excision of a piece of the wall of the sac in order to prevent readhesion. Neugebauer favors galvanocaustic opening, in order to guard the wound against infection. Staude reports an interesting case in which a hæmatometra and hæmatokolpos lateralis were mistaken for an ovarian tumor, and the real condition was not recognized until after laparotomy and puncture. Staude then pushed a trocar through the vagina into the blood sac and allowed it to remain. The perforation of the uterus was closed with four silver sutures, recovery. The diagnosis was confirmed on subsequent autopsy.

DANGERS OF THE OPERATION.

Operative interference in the various forms of atresia almost always consists of perforation or incision through a slightly vascular tissue. I is only in opening broad vaginal atresiæ that an extensive wound is made, and in addition there is danger of wounding the peritoneum, large vessels or adjacent hollow viscera. Hence the operation might be regarded as very mild, yet the mortality is higher than that of many operation which are apparently much more severe But Boyer and Dupuytren g too far when they claim that old and complicated cases are absolutel fatal. Accidental injuries play only a small part among the causes o death. The large majority of those who died succumbed to septic processes or to rupture of blood sacs in the tubes or uterus. Tetanus ha only been observed in one case.

Sepsis is very rarely the result of direct infection of the small wound, but is almost always due to decomposition of the incompletely evacuated contents of the blood sac. It usually runs its course, therefore, as a septic peritonitis.

Perforation of blood sacs in the tubes either proves fatal from internal hemorrhage or acute perforation-peritonitis. It is sometimes observed a few hours or days after the operation, in other cases not until the fourteenth or nineteenth day, conciding with the next menstrual epoch, which gave rise to increased size of the retention-sac. Brittleness of the distended, thin tubal walls, whose texture is changed by previous inflammatory processes, is the chief predisposing factor to rupture; septic processes after the operation may increase this brittleness. This explains the often observed coincidence of sepsis and rupture.

But this is not the immediate cause of the rupture. It was formerly attributed to uterine contractions, which, after incomplete evacuation or adhesion of the point of puncture, forced the blood from the uterus into the tubes. This explanation is unsatisfactory. Apart from the fact that evacuation is not often incomplete and that the puncture does not close, the action of uterine contractions on the tubes is generally impossible, because the uterine extremity of the tubes is closed. Nor would this explain the fact that the rupture occurs after and not before the operation.

The latter consideration indicates that the changes produced by the operation itself are a predisposing factor to rupture. These may be connected with changes in abdominal pressure. The evacuation of the uterine cavity diminishes the pressure within it and its vicinity, while it remains the same in the distended tubal sacs; this is apt to be followed by rupture towards the side of diminished pressure. Moreover, after evacuation of the main tumor the thin-walled tubal sacs are much more exposed to external injurious influences, particularly to abdominal strain.

But by far the most important factor is the traction exercised by the diminished uterus upon the tubes, which are adherent to surrounding parts, particularly to the parietal peritoneum. The fixed tubes can not follow the traction of the uterus and therefore burst. The tubal sacs, in the vicinity of the point of rupture, are always adherent to the abdominal walls by surface or band-like adhesions. Under such circumstances, as a matter of course, sudden exertion of abdominal pressure, and perhaps the occurrence of uterine contractions, are especially dangerous, because both factors cause further displacement of the uterus. Perforation occurs very often during a violent movement in suddenly sitting up or turning around or in straining at stool. It may also result from improper therapeutic measures, such as forced injections into the uterus for the purpose of liquefying viscid contents; or direct compression or kneading of the blood sacs in order to accelerate the slow evacuation.

The recognition of the causes of rupture points to the precautions which promise a certain degree of security against this serious accident. Some of these precautions purpose the prevention of decomposition within the retention-sac.

An important feature is the selection of a suitable period for the operation. As the increased size of the retention-sacs, associated with the catamenial congestion and hemorrhage, may favor the occurrence of rupture, it is best to operate soon after the cessation of a menstrual period, in order to gain as much time as possible before the next menstruation. Unfortunately it is often difficult, after the disease has lasted a long time, to distinguish the individual menstrual epochs by the periodical increase of the now constant pains.

The mode of evacuation is also to be considered. It should be performed slowly, in order to avoid sudden changes of pressure within the abdominal cavity, or rapid and forcible traction on the adhesions. Direct external pressure on the opened sac is to be strictly avoided, and abdominal strain is to be eliminated by the use of an anæsthetic, an advantage which may, however, be converted into the opposite by the subsequent vomiting.

During evacuation the diminished pressure in the abdominal cavity may be replaced by applying to the entire abdomen a layer of cotton as deep as the hand. This compensates the differences of pressure which might otherwise develop between any retained blood sacs and the surrounding parts, and at the same time prevents or diminishes sudden changes in pressure during coughing spells, etc.

This method of slow evacuation permits a gradual change in the position of the abdominal and pelvic viscera, corresponding to the removal of the contents of the sac. It also opposes the aspiration of air through the operation wound, which is apt to occur if the pressure within the sac becomes less than that of the atmosphere, because the firm-walled or adherent sac is unable to descend. The entrance of air must also be guarded against by preventing (during or after the operation) the gaping of the wound by the introduction of the finger, sounds or injections, especially after the pressure within the retention-sac has sunk very low and the contents escape very slowly.

On the other hand, decomposition of retained contents must be guarded against by securing permanent free escape. In membranous occlusion this is readily effected by sufficient width and suitable shape of the opening. But in broad atresiæ it is almost always necessary to keep the new formed canal open by the insertion of canulæ or glass tubes. When this is done the instruments must be closed antiseptically, in order that, at least, only disinfected air may enter.

After the operation the intestines and uterus are kept completely at rest for some time by large doses of opium or morphine, and we must endeavor, in every possible way, to maintain the most complete bodily rest and the avoidance of abdominal pressure.

The strict performance of all these measures enables us to diminish the frequency of rupture to a considerable degree. But all these plans attempt to remove the extrinsic causes of rupture, while they leave unchanged the real source of the danger, *viz.*, the persistence of closed tubal blood sacs. So long as these sacs, which can not be evacuated into the uterus or rapidly absorbed, exist, the patient is not safe against the danger of perforation. Kaltenbach recommended, therefore, that the encapsulated tubal sacs be evacuated separately by means of vaginal or rectal puncture. Hausmann subsequently recommended puncture through the abdominal walls. These suggestions have not been carried out practically heretofore. If the tubal sacs are diagnosed with certainty but cannot be easily punctured, laparotomy appears decidedly justifiable; bands of adhesions, which are present, may then be divided, or the dilated tubes may be removed at the same time. After rupture has occurred, laparotomy, following by cleansing and drainage of the abdominal cavity, offers the only chance of recovery.

AFTER-TREATMENT.—PROGNOSIS.

The principles upon which the after-treatment is based are contained in part in the previous remarks. The abdomen is kept immovable by a bandage, the cotton which has been applied during the evacuation of the sac being kept in position by an abdominal bandage. In front of the genitalia is placed a wad of dressing cotton or iodoform gauze, in order to catch any trickling contents and prevent decomposition. The patient must remain on the back at least ten to twelve days, and may not turn or sit up in bed. The intestines are kept quiet for a week by means of opium and during this time the patient takes only fluid food. The first evacuation from the bowels must be facilitated by aperients, careful enemata and even the manual removal of hard scybala. The patient may not leave the bed before the termination of the next menstrual epoch.

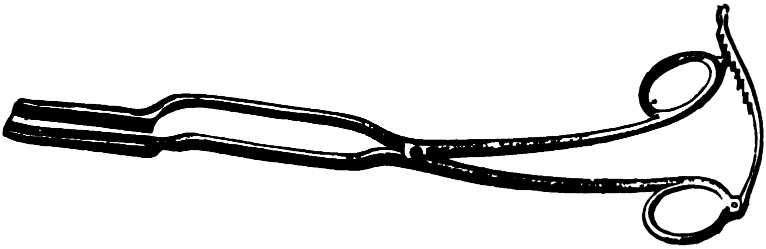
FIG. 180.

The main objects of after-treatment, in other respects, are the maintainance of the patency of the canal and the avoidance of decomposition within the sac. As a rule, these objects are secured with difficulty only in broad atresiæ and very narrow perforation. The closure of the newly formed canal is so frequent under such conditions, that among forty-two cases collected by Puech, a second operation was necessary fourteen times. This was formerly prevented by the permanent insertion of the trocar canula, elastic catheters, metallic tubes, etc. As this was not done, as a rule, under strict antisepsis, decomposition often occurred within the blood sac. This experience led to the introduction of double canulæ, which permitted the use of disinfectant solutions. Breisky pushes over the handle of his trocar knife the so-called forceps canula (Fig. 180), which consists essentially of two half-furrows, which may be separated from one another. By means of this instrument the site of puncture is to be dilated to such an extent that a double tube with a pipe-shaped button and six to seven cm. long (Fig. 181) may be introduced. The button is to be pushed to the region of the former atresia and keeps it dilated; into its outer end fits a tubular piece, through which antiseptic solutions may be injected into the retention-sac

But even this apparatus does not prevent the entrance of air and decomposition. The best results are probably obtained from the introduction of a simple glass tube, which is loosely stuffed with iodoform gauze so that it drains well. Its outer end is placed on a thick wad of carbolized or salicylated cotton. If the entire field of operation has been carefully disinfected with corrosive sublimate, decomposition within the retention-sac is avoided and disinfectant injections are superfluous.

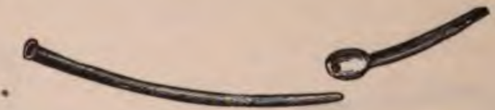

FIG. 181.

If the latter cannot be dispensed with, on account of some flow in the antisepsis, their application demands the greatest caution. The fluid is brought to the temperature of the body, and injected under very slight pressure. Entrance of air must be prevented and free escape of the fluid secured. This may be effected by the use of a funnel apparatus and Fritsch-Bozeman's catheter.

We must carefully distinguish those measures which are employed to maintain the patency of the former occluded part from the subsequent attempts at distension of a canal which was primarily made too narrow or has undergone cicatricial contraction. Formerly the operation was usually followed at once by dilatation with tents, glass rods, the finger, bougies, etc., and this contributed not a little to the bad results. Such attempts at dilatation are only permitted from the time when, after considerable diminution in the size of any tubal sac which may be present, the rupture of the latter is no longer to be apprehended.

In shorter atresiæ (about two cm. wide) the readhesion of the canal may be prevented by supplying it with mucous membrane. The vaginal wall is dissected from its base in a ring above and below the atresia, and is then united upon the denuded cicatrix. Even if union occurs only in a few places, the patency of the canal is secured.

The prognosis of the operation depends mainly on the anatomical character of the atresia and the duration of the retention. The more extensive the adhesion and the more inaccessible the occluded part, the more severe will be the operation.

The longer the retention lasts, the more advanced will be the inflammatory changes around the retention-sacs, and the more is the existence of peritoneal adhesions and closed tubal blood sacs to be feared.

According to Puech, among 139 operations for imperforate hymen there were 6 deaths; among 28 cases of congenital atresia of the vagina, 2 incomplete operations and 6 deaths (rupture 4 times); among 33 acquired atresiæ, 8 incomplete operations and 6 deaths (1 rupture); among 42 obliterations of the uterus, 4 deaths.

In the successful cases the restoration of the sexual functions is complete unless prevented by other causes. The patients sometimes conceive a few weeks or months after the operation and give birth repeatedly to children.

Division of Congenital Vaginal Septa.—Operative Treatment of Vaginal Stenoses.

Vaginal septa are usually the remains of the original reduplication of the vaginal canal. They occur in all degrees of transition from sagittal bands and membranes to complete reduplication of the organ. Irregular ligamentary bridges form more rarely after ulcerative processes and after adhesion of flaps of the vaginal mucous membrane or lips of the cervix (which have been torn off during parturition) to some part of the opposite vaginal wall.

These septa may be important obstetrically, inasmuch as they interfere with the descent of the child. As a general thing they do not acquire a gynecological interest unless they are associated with occlusion of one-half of the vagina or uterus, or interfere with cohabitation.

Rogers and Breisky divided band-like vaginal septa, because violent dragging pains occurred during intercourse. In Breisky's case the muscular band developed after parturition. By division of a wedge-shaped vaginal septum, which was associated with double uterus, Tauffer rendered intercourse, which had been performed per urethram, possible in the normal way. Conception occurred soon afterwards. Sautesson divided a septum, which extended through the entire vagina, in order to gain access to an occluded uterus bicornus unicollis.

The septa rarely contains large vessels. If they are of small size, they are divided between two ligatures *en masse*. Larger ones are divided step by step between two forceps, and the cut surfaces are stitched.

In rare cases, transverse septa are observed in the vagina. Semi-lunar or circular folds of the normal vaginal wall project into the lumen of the canal in such a way that the vagina is divided as by an annular stenosis, into two, usually unequal halves. These annular folds occasionally interfere considerably with exposure of the portio, inasmuch as valvular specula cannot be pushed through the narrow opening. The portio can only be exposed by grasping it, under the guidance of the finger, with a tenaculum, and drawing it through the ring like a glans out of the prepuce. If these narrow rings are situated near the uterus they become important from a functional point of view because the portio above them is concealed in a niche of the fornix, and no longer communicates directly with the lower portion of the vagina.

Kaltenbach observed four cases of transverse vaginal septa in the fornix, which were associated with sterility. In two discission was performed on account of associated stenosis of the internal os and conicity of the portio; the operation was unsuccessful. In another case Kaltenbach stitched the anterior lip of the cervix to the anterior edge of the annular fold, and thus gave the cervical canal a more favorable direction for conception. Nothing is yet known concerning the result. This method seems to be worthy of further trial, inasmuch as simple longitudinal division or transverse excision of these rings hardly promises any good results.

Apart from the puerperal condition, acquired stenoses of the vagina rarely indicate operative interference. We should first try slow dilatation with hard rubber tents, and longitudinal division of projecting cicatricial bands. In one case of acquired stenosis Credé stitched into the vagina a flap taken from the mons veneris, labia majora and perineum; recovery.

Operation for Atresia Ani Vaginalis.

Atresia ani vaginalis is the only form of cloaca which possesses gynecological interest. In this condition the anal opening is entirely absent or is merely indicated by a shallow depression. The lower end of the rectum generally empties directly above the vestibule into the posterior wall of the vagina. In rare cases the rectum terminates in a blind extremity high up, while an open portion of the gut communicates with the vagina at the level of the fornix. The rectal mucous membrane often protrudes through the vaginal anus. If the opening is wide the disturbances are often very slight, and if it is surrounded by a special sphincter, even incontinence of fæces is absent.

But if the vaginal opening is narrow, the evacuation of fæces may be seriously interfered with, so that even in the new-born it may become necessary to operate in order to save life. In many cases surgical aid was not called upon until the period of puberty, on account of disgusting interference with the sexual functions or incontinence of fæces. Dieffenbach describes two methods of operation.

I. *Division.*

Immediately behind the fossa navicularis a knife is inserted outside of the vagina and upon a grooved director in the rectum, and the integument then incised as far as the coccyx. The rectum is then exposed and its edges united to the edges of the integument. During the after-treatment the vaginal opening is closed by touching it with nitrate of silver.

A much more perfect operation is that of

II. *Transplantation.*

The exposed extremity of the rectum is cut off from the posterior wall of the vagina, drawn backwards, and fixed in its natural position. Dieffenbach first excised an oval piece of integument from the anal region, and in order to secure better exposure, made a transverse incision in the anterior part of the perineum. Esmarch contents himself with simple longitudinal incision in the raphé, from the tip of the coccyx to near the posterior commissure of the vulva. From here the blind sac of the rectum, which is protruded by means of a catheter passed through the vaginal anus, is separated from the surrounding cellular tissue (blunt instruments being used as much as possible), and finally the extremity of the rectum is separated from the vagina with a fine pair of scissors. This gives rise to an opening in the posterior vaginal wall, which is at once closed accurately with a few sutures. The end of the rectum, which has been cut off, is made still more freely movable by small incisions with the scissors, drawn backwards and downwards, dilated as much as necessary, and stitched to the edges of the cutaneous incision by means of fine sutures. The anterior extremity of the cutaneous incision is closed separately by a few sutures, in order to make the perineum somewhat broader.

Esmarch thinks it probable that in this way the fibres of the internal sphincter, which surround the abnormal orifice, may be removed, and after transplantation to the normal position, assume the functions of the sphincter.

Some operators simply make an incision from the vaginal anus through the vestibule and entire perineum, and then unite the edges of the rectal wound with the cutaneous wound. This produces a complete cloaca, whose operative treatment by perineo-plastic methods is delayed until a later period. The objections to this method are evident from the above remarks.

The operation is well tolerated even in the new-born, and gave satisfactory results even in the præ-antiseptic period. Among ten operations collected by Curling, only one terminated fatally.

CHAPTER VI.

OPERATIONS IN URINARY FISTULÆ.

HISTORY OF THE OPERATION.

THE recognition of urinary fistulæ in the female dates from the end of the sixteenth century, but more accurate statements were first made by Mauriceau and Levret in the eighteenth century.

Hendrick van Roönhuyzen (1663) was the first to recommend operative treatment of the fistulæ by denudation and sutures. The first cure with the aid of sutures is said to have been made by Fatio in 1752. Then this plan fell into disrepute until the beginning of this century, when the most varied methods of suture were tried. Some physicians combined cauterization, instead of denudation, with the sutures. Transplantation was also employed to restore openings in the wall of the bladder.

The bad results obtained by these methods even in the hands of the best surgeons were the result of the faulty operation itself, the imperfect exposure of the field of operation, the insufficient denudation and the lack of antiseptic precautions.

A decided advance was made by the "méthode autoplastique par glissement" of Jobert de Lamballe. He improved the exposure of the fistula by drawing the uterus down as far as possible with Museux forceps, and pushing the fistula forward with the catheter; and at the same time denuded a broader surface.

A further advance was made in 1845 by Sims. The essential improvement of Sims's method consisted in the excellent exposure of the fistula by the employment of lateral decubitus, and the valvular speculum. He also denuded the edges of the fistula very widely, and introduced silver sutures into practice. Bozeman, a pupil of Sims, retained the method of denudation, but operated in the knee-elbow position, and devised a new method of suture. He attached great importance to the preparatory dilatation of the cicatrically contracted vagina. In England especially Bozeman and Sims's operation was received with the greatest enthusiasm.

The present degree of perfection of the operation is undoubtedly due to Simon. He showed that the chief importance, as in other plastic operations, must be attached to exact denudation and careful suture.

His excellent results were obtained with silk sutures, and he showed that the choice of the material of sutures exercises a minor influence on the results of the operation. Simon also simplified the after-treatment and perfected the mode of operation in very difficult cases. Finally, he devised "transverse obliteration in the vagina," an entirely new method for the relief of incontinence in hitherto incurable cases.

ANATOMY OF URINARY FISTULÆ.

The large majority of urinary fistulæ occur in difficult labor from compression-necrosis or the improper use of instruments. Perforations of the vesico-vaginal wall by pessaries or calculi in the bladder are, with few exceptions, the only other forms which need be considered with regard to operation.

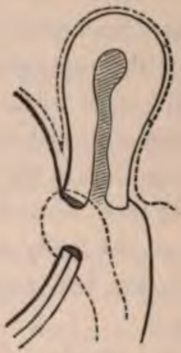

FIG 182.

The septum between the urinary passages and genital tract may be perforated in various places, and we distinguish urethro-vaginal, vesico-vaginal, vesico-uterine, uretero-vaginal and uretero-uterine fistulæ. Several of these forms may be present at the same time, or there may be two vesico-vaginal fistulæ.

Vesico-vaginal fistulæ are the most frequent. They may occur in any part of the vesico-vaginal septum, which is about 5 cm. long (from the internal meatus of the urethra to the fornix) and 4 cm. wide. According to its situation the edges of the fistula are either formed of the vesico-vaginal septum, or the urethro-vaginal septum or uterus also forms part of the opening. The term superficial vesico-utero-vaginal fistula is applied to those openings in the fornix whose posterior rim is formed by the more or less intact anterior lip of the cervix (Fig. 182). In deep vesico-utero-vaginal fistulæ the anterior lip of the cervix is completely destroyed. The fistula empties directly into the cervical canal and its posterior edge is formed by the coalesced vesico-cervical wall, which grows thinner below (Fig. 183). The edges of the opening may be thin and sharp, sometimes they are thickened and surrounded widely by cicatricial tissue.

Vesico-vaginal fistulæ are situated more frequently on the left side than on the right, rarely in the median line. Their size varies from that of a fine canal as large as a pin's head, to that of a pea or dollar. In very large fistulæ, which are situated usually to one side, a part of the ureters is apt to be involved; their openings may be seen occasionally in the outer edge of the fistula. The relations of the vesical portion of the ureters to the adjacent parts are shown in the accompanying schematic illustration (Fig. 184). The ureters perforate the wall of the bladder obliquely from without and above inwards and downwards, and run for about 1.5 to 2 cm. beneath the mucosa. According to Simon the distance of the openings of the ureters from the internal meatus of the urethra is 4 cm., from the region of the external os 3 cm., and from each other 2.5 to 3 cm. These normal distances may be very much increased or diminished by cicatricial retractions.

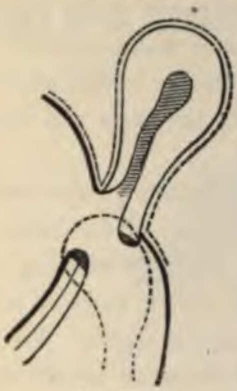

FIG. 183.

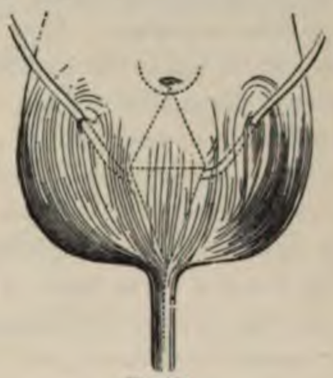

FIG. 184.

For example, the distance between the internal opening of the ureter and urethra may be only 1.5 cm. An implication of the ureters may be assumed in those fistulæ which are situated at the boundary of the upper and middle thirds of the vagina and more to the outside.

The smallest vesico-vaginal fistulæ are simple fissures, rarely twisted canals. Those of a somewhat larger size have a round, transverse oval or semilunar shape, with the concavity upwards; very rarely they are longitudinally oval. Very large openings are quadrangular or assume a caudate or triangular shape from prolongation into the urethra. The capacity of the bladder is considerably diminished by large fistulæ or by marked cicatricial retraction in the fundus of the organ. If all the urine escapes through the fistula, the bladder is permanently contracted and its walls thickened. After the more severe injuries during parturition the bladder wall next to the symphysis, and even the periosteum of the pubis, may undergo pressure-necrosis. After such extensive destruction the entire bladder and the fistula will be fixed to the posterior surface of the symphysis when cicatrization sets in. Exposure of the parts and operation are very difficult in such cases.

The vesical mucous membrane often prolapses through the fistula and there is sometimes a true inversion of a large part of the entire bladder, so that it descends far into the vagina in the shape of a bag varying from the size of a nut to that of a hen's egg. Simon observed adhesion of the inverted bladder to the posterior wall of the vagina. The vesical mucous membrane at the edges of the fistula is incrusted not infrequently with urinary salts, or large calculi may form in the bladder.

After the fistula has lasted a long time the urethra is often narrowed. It is sometimes entirely obliterated on account of the contusion suffered during delivery. The length of the atresia varies from 1 to 1.5 cm. and it almost always involves the part next to the bladder. The atresia of the urethra occurs in two principal types. It is either associated with a simple vesico-vaginal fistula, or it is situated between a urethral and a vesico-vaginal fistula. The permeable portion of the urethra empties at various distances from the external orifice into an opening into the vagina corresponding to its lumen, *i.e.*, about the size of a pea; then comes the atresia, and immediately behind this (rarely at a higher portion of the base of the bladder) the vesico-vaginal fistula. The urethral fistula in front of the atresia is not to be considered as an isolated defect of the inferior urethral wall, but is caused by the almost complete separation of a strongly contused part of the urethra from the healthy remainder. The obliterated portion often appears deeply retracted and fixed to the symphysis, where it is readily overlooked, inasmuch as the catheter may pass directly through the urethral fistula into the opposite vesico-vaginal fistula (Fig. 185). It is not until the parts are separated with a tenaculum that the real condition is recognized. The atresia here forms the apex of an angle of flexion between the bladder and urethra (Fig. 185). It is only exceptionally that the posterior wall of the urethra (4 cm. in length) is alone perforated by a fistula without further complications. These isolated urethro-vaginal fistulæ are less frequently the result of pressure-necrosis than of injury by splinters of bone, catheters or obstetrical instruments.

On account of the constant soiling with urine the vaginal mucosa becomes strikingly smooth like a serous membrane. Ulcers and excoriations may develop here and there, and become incrusted with urinary salts. Finally, the irritation of the ammoniacal urine may lead to the formation of extensive condylomatous excrescences in the vagina, vulva and external integument. But the changes due to injury during delivery are more important. These are rarely confined to the immediate vicinity of the fistula; the entire vagina is often shortened longitudinally and transversely by cicatricial retraction. Thus the distance from the internal meatus of the urethra to the fornix may diminish from 5 cm. to 1½ or 2 cm. Annular stenoses often result from cicatrization of extensive losses of substance. Here the vagina, growing gradually smaller, passes directly into the fistula or terminates below it in a round or slit-shaped opening which is directed straight upwards or somewhat to the side, and whose size varies from that of a pea to a diameter of 1.5 cm. Either be-

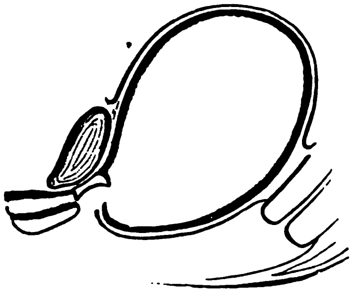

FIG. 185.

low or at the level of the fistula we may succeed not infrequently in pas ing a sound anteriorly into the bladder, posteriorly into the uterus. B examination with the sound often affords no definite information, and i amenorrhœa is also present, it remains uncertain whether the uter communicates freely with the bladder above the stenosis or not. Th posterior rim of these stenoses is formed by an angular projecting rid of the posterior vaginal wall, which, on account of the marked cicatrici retraction, is not far distant, as a rule, from the fornix, and therefo from the floor of Douglas's sac.

Stenosis and complete atresia may form even above the fistula, so th the uterus and perhaps the fornix which has been left, are entire separated from the lower part of the vagina. In this event the posteri edge of the fistula is formed by the vesico-vaginal septum, which is adherent to the posterior vaginal wall (Fig. 186.)

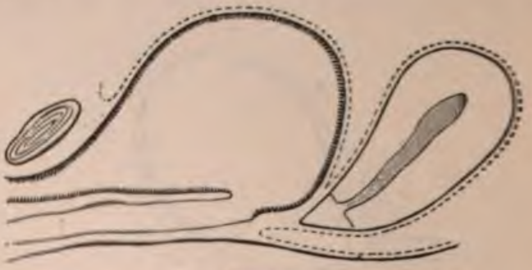

FIG. 186.

In much rarer cases the uterus is prolapsed and the vaginal walls relaxed and elongated. This occurs almost entirely in those fistulæ which are produced by wearing pessaries.

The uterus is usually implicated. The portio vaginalis and the anterior cervical wall are often entirely destroyed, or only a few ragged shreds of the lips of the cervix are left. Even the entire cervical canal and fornix may be obliterated as the result of deep-spreading pressure-necrosis. As a rule, such extensive destruction is accompanied by severe inflammatory processes in the parametrium and pelvic peritoneum. The remaining cicatricial bands then fix the uterus to the anterior wall of the pelvis, and give rise to further changes in the shape and position of the organ. Extensive parametritic and peritonitic callosities, in conjunction with the secondary changes in the ovaries, occasionally result in hyperinvolution and complete atrophy of the uterus. Menstruation ceases, and the menopause sets in prematurely. Traction of the peritoneal covering of the uterus must also be mentioned as a very important sequel of parametritic and perimetritic inflammatory processes. This may draw the anterior as well as the posterior peritoneal folds into the immediate vicinity of the field of operation. The anterior flexure of the peritoneum which is normally situated about at the level of the internal os, *i.e.*, 2 cm. from the highest point of the anterior fornix, may be drawn, in extensive destruction of the anterior cervical wall, into the immediate vicinity of the upper rim of a deep vesico-utero-vaginal fistula. Douglas's sac is still more apt to be drawn into the denuded portion, when freshening the posterior edge of a high vaginal stenosis, or the remains of the posterior lip of the cervix together with the adjacent fornix. If the uterus is also retroverted these parts occasionally project at an angle towards the vagina (Fig. 187). In prolapse of the vagina with a large cystocele the peritoneum may also be displaced and endangered, inasmuch as the prolapsed bladder draws its peritoneal covering so far down that it partly covers the anterior vaginal wall in the vicinity of the fistula.

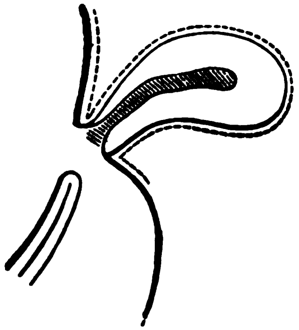

FIG. 187.

In vesico-uterine fistulæ (Figs. 188 and 202) the vesico-cervical wall is perforated by an opening, the vaginal insertion being intact. These fistulæ never attain a large size.

Nine cases of uretero-uterine fistula have been observed. Freund alone obtained a *post-mortem* examination.[1] The fistulæ were always situated on the side of the cervix (six times on the left side). The ureters, after their entrance into the parametrium, run in an S-shape along th cervix and vagina, and then bend 2 to 3 cm. below the os to the anteri surface of the latter, with which they are in contact for 1 to 5 cm. Th are separated from the uterus by a large venous plexus and loose cellul tissue, their distance from the lateral edge of the uterus at the level the internal os being 2.5 cm., at the supra-vaginal cervix 0.8 cm and at the level of the fornix 0.6 cm. (*vide* Fig. 189, after Luschka This considerable distance from the uterus protects the ureter as a ru from implication in lesions of the cervix. But the relations are change if the ureter has been drawn towards the uterus by cicatrices, or if, in a generally contracted pelvis, the cervical canal has been dilated for a very long time by an impacted member of the child.

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[1] The ureter was hydronephrotic above the fistula, then adherent (for a distance of 6 cm.) by parametritic exudation to the adjacent cellular tissue and cervix. The ureter was narrowed below the capillary fistula, which communicated with the ulcerated cervix.

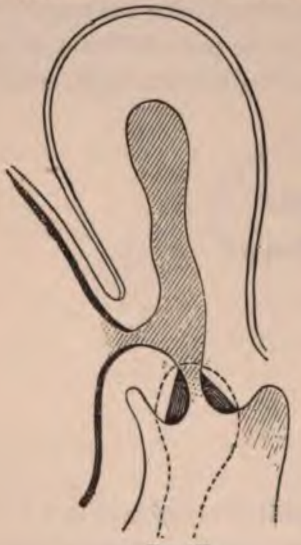
FIG. 188.

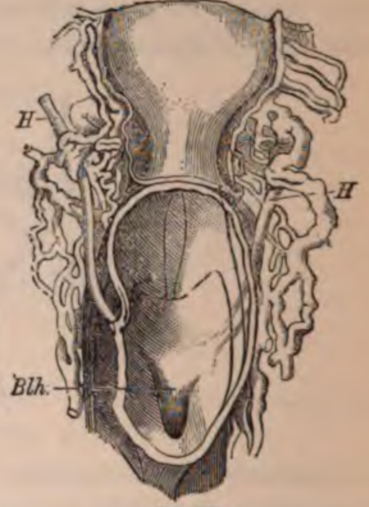

FIG. 189.

Isolated uretero-vaginal fistulæ, without an opening into the bladder, have been observed by several writers. They are either primary or are left over after closure of a large vesico-vaginal fistula. They form sharp-edged openings or the ureter empties into the vagina with a button-shaped prominence. They are situated to one side, about 1 to 2 cm. from the os uteri in its elongated fissure, or somewhat behind this line.

After long standing of the lesion the vesical end of the ureter becomes obliterated, except in a few cases, in uretero-vaginal and uretero-uterine fistulæ.

In addition to urinary fistulæ other lesions of the sexual organs are not uncommon—for example, fissures in the recto-vaginal septum, recto-vaginal fistulæ. Hack observed a vesico-rectal fistula, *i.e.*, the bladder communicated, within an atresic vagina, with the rectum. An important factor with regard to the success of the operation is the condition of the higher portions of the urinary passages (purulent catarrh of the ureters and renal pelvis with dilatation of these parts and formation of calculi, abscesses and atrophy of the kidneys.)

During childbed the original dimensions of the opening usually diminish considerably, on account of cicatricial retraction of the edges. Thus, we observed three weeks after delivery, a vesico-vaginal fistula as large as a mark piece, which three weeks later only admitted the end of a sound. It is evident that even complete spontaneous recovery could occur in this way, and this effect is then ascribed to quite useless therapeutic measures, such as cauterizations and vaginal injections, vaginal tampons, the permanent introduction of a catheter, or abdominal or latero-abdominal decubitus. In some cases continence was restored by adhesion of the vagina below the fistula. Spontaneous recovery proper does not occur after the termination of puerperal involution and the healing of the edges of the fistula. But considerable improvement of the incontinence was observed occasionally after the formation of vaginal stenoses below the fistula or the occlusion of the fistulous opening by calculi. Dieffenbach observed a similar good effect from the adhesion of the prolapsed vesical mucosa to the edges of the fistula and opposite part of the vagina.

INDICATIONS.—PERIOD OF OPERATION.

In urinary fistulæ the object of the physician is the cure of the incontinence of urine. This is not alone a disgusting, and if deep excoriations are present, a very painful affection, but it may also endanger life by secondary changes in the urinary organs. Operative treatment is attended with such little danger that there can hardly be any question of contra-indication apart from the cases of carcinomatous perforation. Age, the general condition and the various phases of sexual life are much less important than in other operations. Simon operated successfully on a child of eight years, in whom the fistula was produced by a large vesical calculus. The operation is often performed successfully upon women at the menopause. One of Hegar's patients was sixty years, old and had acquired the fistula thirty-five years previously. In very decrepid, paralyzed individuals the operation may be very important, inasmuch as it renders nursing easier and prevents bed-sores. Simon operated repeatedly during menstruation. Watson, Baker-Brown and Schlesinger operated during pregnancy, the course of which was not interrupted.

The most favorable time for the operation is the sixth to eighth week after delivery. The lochia have then ceased and the edges of the fistula are clean, after exfoliation of the necrotic tissue. The edges are vascular and succulent, and possess the firmness required for the support of the sutures. At an earlier period there is danger of infection of the wound by the lochia, the hemorrhage is greater on account of the larger size of the fistula and greater vascularity, and the tissue is so brittle, that the speculum and sutures produce injuries everywhere. If we wait longer—Sims and others operate from the sixth to ninth months—the conditions for union by first intention become less favorable, because the edges of the opening are often surrounded by firm cicatricial tissue which is no longer so movable.

When fistulæ are produced by calculi or pessaries the operation is delayed until the edges of the opening have been cleaned by antiseptic treatment.

The restoration of continence may be effected (1), by direct closure of the fistula; or, (2), by closure of the genital tract below the fistula. The second method is only employed when the first appears to be too dangerous or technically impracticable.

In the large majority of cases direct closure is effected with sutures, very rarely by means of cauterization.

DIRECT CLOSURE OF VESICO-VAGINAL AND URETHRO-VAGINAL FISTULÆ BY MEANS OF SUTURES.

Special preparatory treatment may be necessary when extensive cicatrices, stenoses of the vagina, interfere with exposure of the fistula. In such cases Emmet used Sims's glass dilators. Bozeman's method consists in the gradual dilatation of the cicatricial masses by incisions, followed by the introduction of soft rubber tampons or hard rubber cylinders. At the same time he ascertained, by means of the spring balance, the amount of force necessary to approximate the edges of the fistula. This method is very valuable in certain cases of vaginal stenosis. It sometimes secures the recognition of very complicated anatomical conditions, and affords favorable conditions for union by making the edges of the fistula more movable. On the other hand it is almost or entirely useless in rigid parametral callosities and adhesion of the wall of the bladder to the posterior surface of the symphysis. Moreover, it is always very annoying to the patient on account of its long duration and painfulness, and is not devoid of danger. Pus and decomposed urine are pressed for hours against the separated wound surfaces. Fever is apt to develop from infectious condition of the urinary passages and pelvic cellular tissue.

If preliminary dilatation of the vagina is necessary, Simon's method of rapid dilatation, in skilled hands, almost always deserves the preference. Cicatricial bands and adhesions are divided with the knife, and then successively larger valvular specula are rapidly introduced. Traction with forceps or the application of weights may also be used to make the lips of the cervix or the unyielding edge of a fistula movable. Rapid dilatation is difficult, but it effects a saving of time in the duration of treatment, which is a very important gain in hospital hygiene.

A very important feature in some cases is the preliminary treatment of purulent or ichorous catarrhs of the bladder or higher portions of the urinary passages, since the plastic results of the operation are apt to be endangered by infection of the wound from the bladder.

If the operation is performed soon after childbed, prophylactic injections of hot water are useful in diminishing the hemorrhage during the operation.

Narcosis is unnecessary in many cases, since the operation is not very painful, unless there are fissures and papillary excrescences at the introitus. Szymanowsky relates that some of his patients threaded the needles during the operation. But in anxious and unintelligent patients, the necessary quiet and fixation of the field of operation can only be secured by the administration of an anæsthetic.

First Stage.—Exposure of the Fistula.

Position.—Simple lithotomy position is suitable only in very deeply situated fistulæ, or when the uterus and vagina are prolapsed.

The knee-elbow position has been recommended recently by Bozeman.

The patient is fastened to a special table. The position is extremely ann ing to the patient unless she is under the influence of an anæsthet The fistula is easily seen, because the vagina is bellied out by the exter atmospheric pressure, but the entire field of operation sinks so far aw from the introitus that the handling of the instruments becomes v difficult. It can be regarded as a merely relative advantage of this po tion that the blood flows into the bladder and the operator is not disturb by hemorrhage. But the elongation of the vagina in this position m be very useful in bringing into view very small and high fistulæ, whi are concealed between the folds of the mucous membrane.

Simon's breech-dorsal and Sims's lateral position are employed m frequently at the present time. The fistula is exposed well in both po tions, but the latter is decidedly more convenient to the patient.

The posterior vaginal wall is drawn back by a Sims or Simon speculu the lateral walls are separated by lateral retractors. If the anter vaginal wall projects below the fistula, it is held down by a short Simo vaginal holder or drawn down with a tenaculum. A similar plan adopted with disturbing folds of the mucous membrane in other parts.

Forcible traction on the uterus with Museux forceps or threads fac tates exposure considerably, but caution is necessary after inflammat processes in the pelvic cellular tissue and peritoneum. It is sometin better to push the lips of the cervix backwards with hook forceps, and th to stretch the edges of the fistula. Protrusion of the fistula from t bladder is also very useful. Milliot inserts, for this purpose, a distensi tampon into the bladder. This is done much more simply with a cathe or a sponge on a holder; the latter is passed through the urethra and f tula, and not armed with the sponge until it reaches the vagina. T peculiarities of a case are best recognized if an attempt is made, prior the operation, to expose the fistula in various ways and positions.

The complicated apparatus devised by Neugebauer, Ulrich and othe cannot replace the hands of skilled assistants; the slightest movement the patient at once displaces the entire field of operation. Bozeman method is better adapted for diminishing the number of assistants. this method the lateral vaginal walls are separated by a speculum wi two arms, which can be screwed apart, and the posterior vaginal wall held back by a plate fixed to the sacrum. But the good exposure of t fistula is due, not to the apparatus, but to the knee-elbow position, which the diminution of intra-abdominal pressure causes permanent distension of the vagina, which is filled with air. After various control experiments we have come to the conclusion, however, that Bozeman's method is unsuitable for the operation, because the fistula sinks too far towards the abdominal cavity.

Second Stage.—Denudation of the Edges of the Fistula.

The object of denudation is to produce broad, smooth well-fitting edges of the wound, which are as free as possible from cicatricial tissue and bleed well.

Two methods are employed. Simon freshens the edges in a steep, funnel-shaped direction through the entire thickness of the vesico-vaginal septum without paying any special attention to the vesical mucosa (Fig. 190, *m*, *n*); all the cicatricial tissue in the vicinity of the fistula is excised; the edges of the wound are 6 to 8 mm. broad.

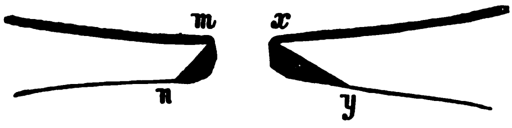

FIG. 190.

In the flat funnel-shaped denudation of American surgeons, the vesical mucous membrane is spared, and a ring, 1.5 to 2.5 cm. wide, is excised around the fistula, chiefly from the vaginal wall (Fig. 190, *x*, *y*). In Simon's method well corresponding edges are produced, and can be approximated without great tension. As the wound surface in the vagina does not extend so far to the outside as in the flat, funnel-shaped denudation, more tissue is left for stretching the edges. In a flat funnel-shaped denudation of 2.5 cm. width, a mass of tissue at least 5 cm. in extent is grasped by the sutures and is thus lost for the stretching of the edges. This large part must be pressed together very strongly, so that the parts outside of the sutures are apt to be stretched too tightly, and the sutures cut through too early. Both methods can hardly be carried out with perfect consistency, and hence free play is left for the practical tact of the surgeon. As a general thing we first make the steep oblique denudation. If we then find that the edges of the wound are markedly infiltrated with cicatricial tissue and bleed poorly, we widen the denudation at the expense of the vaginal wall, and thus obtain flat, funnel-shaped edges from 1.5 to 2 cm. wide. In this way much less tissue is sacrificed (Fig. 191, *p*, *o*) than if, in the steep oblique denudation, we cut entirely to the outside of the cicatricial tissue (Fig. 191, *r*, *s*). On account of the hemorrhage we endeavor, as far as possible, to avoid injury to the vesical mucosa outside of the edge adherent to the fistula.

In small, round fistulæ we are able to determine the direction of the line of union by the mode of denudation. As we need fear no considerable tension from the sides, we may allow the denuded surfaces to run together above and below, so that longitudinal union results, and the subsequent cicatrix runs in a sagittal plane. In transverse or longitudinal oval fistulæ, the angles of the denudation are kept at the ends of the long diameter of the fistula. In very large fistulæ we generally excise the edges according to their contours and decide upon the often complicated shape of union on the introduction of the sutures. The direction of denudation may also be influenced by the presence of cicatricial bands. If, for example, cicatricial masses radiate laterally towards the fornix, the angles of denudation are placed at the sides and the way thus prepared for subsequent transverse union.

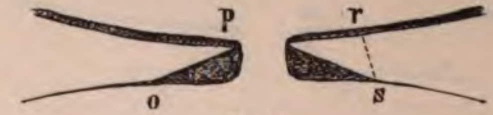

FIG. 191.

Before removal of the edges of the fistula the contours of the denudation are first mapped out with a scalpel through the firm vaginal mucosa. This facilitates the incisions in the deeper, softer layers, and also aids us in finding our way when the field of operation becomes covered with blood. In fistulæ near the introitus an ordinary scalpel is used, while for those situated deep in the vagina, we use long-handled knives with straight or curved blades. (Fig. 192.) During denudation the edges of the fistula are kept tense by means of sharp hooks or forceps. If the vesical mucosa protrudes through the fistula, it must be kept back with a sound or catheter, or by the introduction of a small sponge in the bladder. The knife is then pushed through the entire edge of the fistula to the boundary of the vesical mucosa, and carried in slow strokes along the incision which has been mapped out. The edge of the fistula must be carefully removed in uniform width and thickness towards the bladder. If the knife is skillfully used and the fistula is small, the entire rim may often be removed as a continuous ring. The incision is always begun at the most dependent part, in order that the blood may not interfere too much with our view of the parts.

An assistant wipes the field of operation assiduously with sponges, and compresses any places which bleed to an unusual extent. In profuse parenchymatous hemorrhage, a continuous stream of very hot or cold water is applied to the wound with an irrigator. If larger arteries, particularly the vesico-uterine artery which runs along the side of the cervix and in the fornix, are cut, they are ligated or grasped provisionally with artery forceps, denudation is rapidly completed, and the vessel closed by sutures. If the calibre of the vessel is not too large, the tissue which has been grasped by the forceps is cut off just before tying the sutures. If the vessel cannot be grasped securely, ligatures must be resorted to.

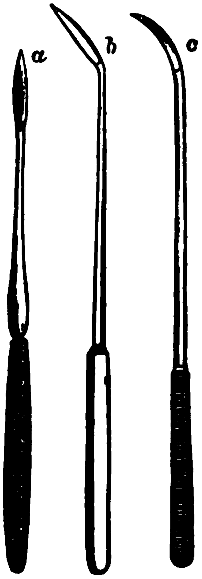

Fig. 192.

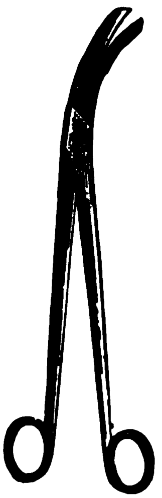

Fig. 193.

After removal of the edges of the fistula the wound is smoothed with scissors curved on the flat and bent somewhat to one side (Fig. 193). Projecting shreds of tissue are seized with forceps and removed. If the first incisions have been made into cicatricial, poorly bleeding tissue, it must be removed over a wider extent until healthier layers are reached. Inequalities are corrected by making the narrow edge of the wound wider. Bozeman is compelled to perform a great part of the denudation with the scissors. His scissors exhibits various curvatures on the flat and even torsion of the blades. We often employ it to advantage in smoothing the edges of the wound. Simon claims that the exclusive use of the scissors

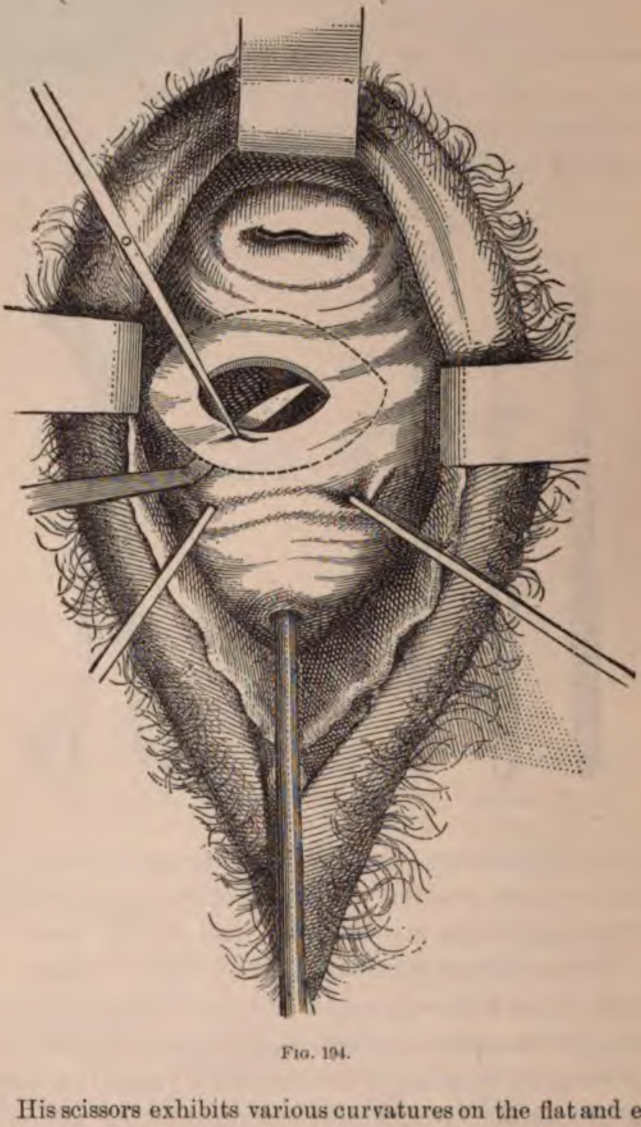

FIG. 194.

contuses the tissues too severely and that broader surfaces than necessary must be removed.

In ordinary vesico-vaginal or urethro-vaginal fistulæ the vesico-vaginal or urethro-vaginal septum alone is denuded (Fig. 194). In superficial vesico-utero-vaginal fistulæ, the anterior lip of the cervix bordering on the posterior edge of the fistula is denuded and stitched to the lower edge, composed of vesico-vaginal or even urethro-vaginal septum (Fig. 182). In deep vesico-utero-vaginal fistulæ operators have hitherto feared to employ the edges of the fistula itself for denudation, but usually united the posterior lip of the cervix to the anterior edge of the fistula (Fig. 183), an operation which is identical functionally with occlusion of the vagina. The narrow lower border of the anterior cervical wall was regarded as unsuitable for union, because it contained too little tissue for a sufficiently broad raw surface, and is movable with difficulty. In addition it was feared that the peritoneum would be injured. But operators always appear to have had a transverse line of union in mind. Recently, however, we have succeeded several times in securing longitudinal union of the edges of the fistula by denuding even very small remains of the anterior cervical wall, if this had not undergone cicatricial changes. (Fig. 195.)

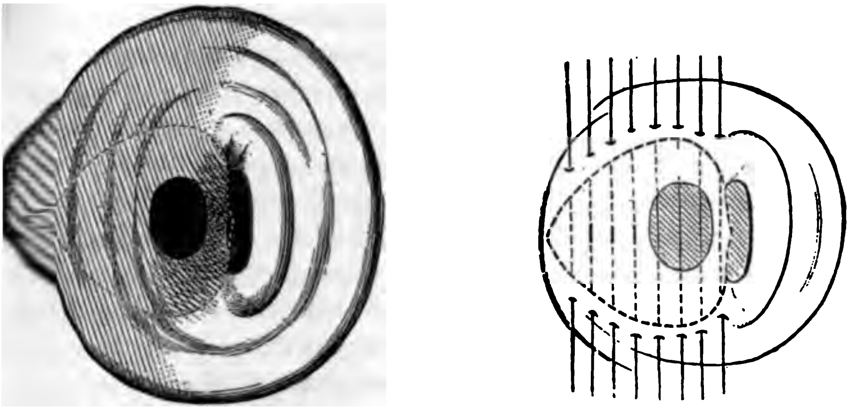

FIG. 195.

In a woman aet. 40 years, the portio vaginalis was destroyed, with the exception of a few nipple-shaped remains of the posterior lip of the cervix. 1.5 cm. of the supra-vaginal portion of the anterior cervical wall were lost; it formed a narrow rim, which, on the sides, passed directly into the edges of the fistula, which was as large as a 5-pfennig piece. The fistula could only be seen distinctly after vigorous separation and partial excision of the lateral and posterior remains of the portio vaginalis. The entire circumference of the fistula and anterior cervical wall was denuded and the edges united from the sides. The wound surface of the anterior cervical wall was so narrow that it afforded room for only a single suture (Fig. 195 *b*), which was passed from left to right beneath its entire base. The wound healed with the exception of a small suture opening in the middle, but this closed spontaneously a week after removal of the sutures.

The anatomical conditions previously discussed render it probable that the ureters are situated more frequently within the region of denudation than is supposed. But it is rare that they project into the fistula as isolated bands, or that their gaping meatus is recognized. In the latter event they may be mistaken for a divided vessel, inasmuch as the urine is sometimes mixed with blood. The diagnosis is easily made from a consideration of the topographical conditions and careful testing of the fluid, which reddens litmus paper. For further certainty, Simon passed a sound into the opening; this entered almost a foot upwards and outwards towards the kidneys. If the ureter is contained within the edges of the fistula, its vesical meatus must be displaced to a position remote from the fistula (Simon). For this purpose the projecting portion of the ureter is shortened with the scissors, its vesical mucosa is divided, or a piece of the uretero-vesical wall is excised laterally, so that the opening of the ureter can not be enclosed by the sutures. But if symptoms of urinary stasis (violent colic starting from the kidneys and radiating along the ureters, vomiting, etc.) should occur at any time, the sutures must be removed at once. In some cases the constriction is relieved spontaneously, either because the sutures cut through prematurely, or the ureter which was distended by the accumulated urine, gradually slipped out of the sutures. As the ureters run for some distance immediately beneath the vesical mucosa, they are less apt to be injured by the flat funnel-shaped than by the steep, oblique denudation.

The peritoneum has been injured repeatedly. Spiegelberg reports a case in which loops of the intestine protruded through the wound. In another instance air passed in and out through the opening. Bozeman observed prolapse of the tube to the side of the uterus. The sub-peritoneal cellular tissue or free cellular tissue spaces at the anterior surface of the cervix are opened, in cases of high fistulæ, even more frequently than the free peritoneal cavity; the latter is guarded to a certain extent by adhesions in the vicinity of the fistula. If the peritoneum is drawn down in cases of cystocele, the cellular tissue may be opened low down in the vagina.

A patient, aet. 50 years, suffered 9 years from complete prolapse of the uterus, which was first replaced by a ring pessary, then for 8 years by a Zwanck's pessary. For one year incontinence of urine. A prolapse of the anterior vaginal wall, as large as a goose egg, is found in the introitus, and immediately behind it a fistula through which two fingers may be passed into the bladder. The catheter can only be passed downwards in the cystocele; the portio vaginalis is situated at the introitus. During denudation, the loose præperitoneal cellular tissue was exposed at the posterior edge of the wound. Transverse union of the fistula by numerous sutures. Recovery without complication.

Third Stage.—Sutures.

If the edges of the fistula are properly denuded, simple sutures will effect union as certainly as in other raw surfaces. All complicated methods of suture are superfluous. In the majority of cases simple needles of various sizes and curvatures, which are fastened in holders, are sufficient. Semilunar needles with a diameter of about 2 cm. are very useful; they are easily manipulated even at a great depth within the vagina. Simpson's long-handled hollow needles, which may sometimes be passed directly through both edges of the wound without further twisting, and Sims's short hollow needles, which can be fastened at various angles, may also be used occasionally with advantage. Silver wire or fine silk (fil de Florence) may be used; we employ the former almost exclusively.

Every operation for fistula requires a number of deep sutures, which include the entire wound down to the vesical mucosa. We insert these sutures close to the edge of the wound, at intervals of 3 to 5 mm. This mode of deep suturing secures very accurate coaptation of the wound, and leaves the greatest amount of tissue on the outside for stretching of the edges. At intervals are placed moderately deep or superficial sutures, as required, in order to secure accurate coaptation of the vaginal mucosa. A single series of sutures is often sufficient in small fistulæ. In the original "double sutures," recommended by Kuechler and Simon, the outer (tension-diminishing) sutures were applied 1 to 1½ cm., and inner (coaptation) sutures, 1 to 1½ lines from the edges of the wound. Simon himself now inserts the outer series 0.4 to 0.5 cm. from the edges of the wound; they include the entire thickness of the edge of the wound with or without the vesical mucosa; the coaptation sutures include the edges of the wound directly (Fig. 196).

After the sutures are introduced the clots caught in the wires are carefully removed, and the wound disinfected; then the sutures are tied. After this the bladder is washed out in order to remove the blood which may have entered, and to test the accuracy of the coaptation.

In some cases the direction of the line of union is determined in advance by the original shape of the fistula or the denudation. But in the majority of cases the operator can determine the most suitable direction for the line of union. Transverse coaptation is almost always preferable, because the uterus and vesico-vaginal septum can be moved much more easily from above downwards than from the sides. In addition, transverse coaptation generally corresponds better to the original shape of the fistula. Longitudinal union is chosen in small, longitudinally oval fistulæ, or in those which extend to the urethral portion. In very large fistulæ the line of union generally is not straight. If the anterior or posterior lip of the cervix is employed to cover the opening, the line of union is slightly arched with the concavity posteriorly (Fig. 197). In triangular or caudate fistulæ with the apex inferiorly, the coaptation is Y-shaped, if the lower part of the denudation is first united from the sides, and then the two upper angles are united more obliquely from above downwards. In large quadrangular fistulæ an inverted ⅄ shaped coaptation may result if the middle portion is first united from the sides, and then the square or triangular openings left above and below are united in a transverse or oblique diverging direction (Fig. 198). The union becomes still more complicated when very extensive openings are covered by excision and transplantation of flaps from the vesico-vaginal septum, or the integument of the nates, as has been done with partial success by Simon and others.

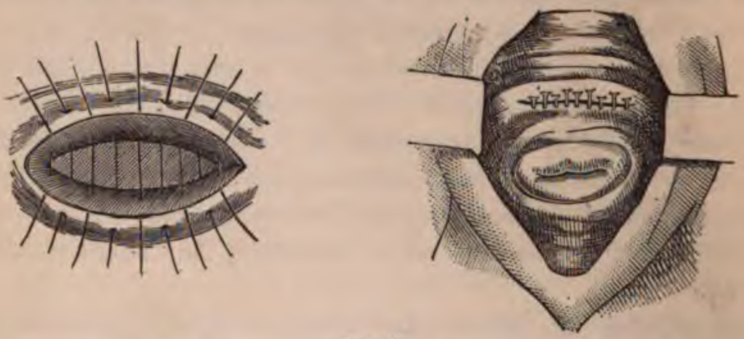

FIG. 196.

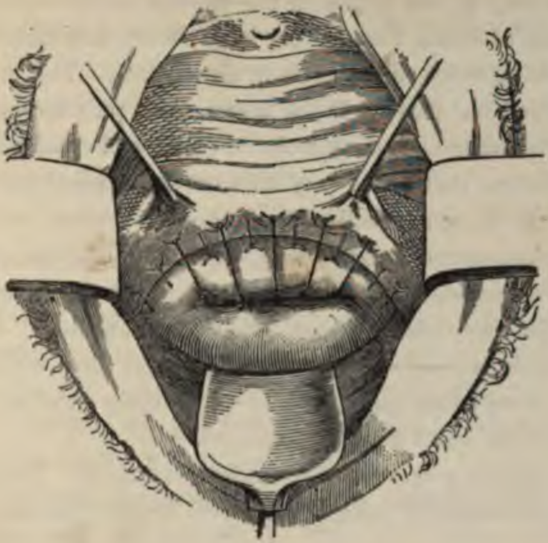

FIG. 197.

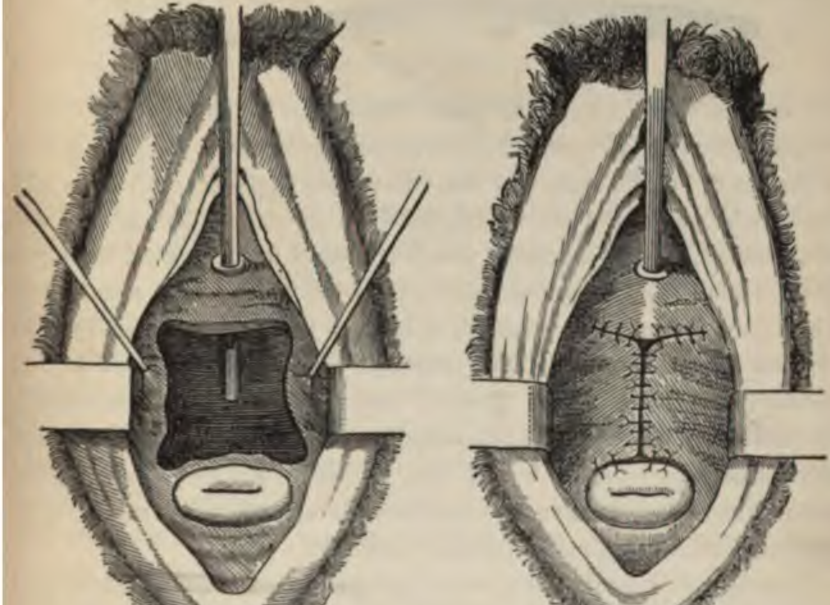

FIG. 198.

The stretching of the edges by the sutures is entirely sufficient for the production of union, even in very large fistulæ, and therefore tension-diminishing sutures are almost always superfluous. The latter sutures, which are introduced parallel to the fistula, must pass through the entire thickness of the vaginal wall in order to effect a displacement of only a few lines. Hence, they are of very little use as compared with the size of the fistula. Much more effective diminution of tension, but at the same time greater danger is secured by transverse division of the anterior lip of the cervix, its separation from the bladder, or even the separation of the latter from the symphysis. These "tension-diminishing" incisions are made very rarely and only in very large fistulæ or those which are firmly adherent to surrounding parts, and in which every auxiliary for the approximation of the edges must be employed.

Bozeman employs a very peculiar method of suture. With his needle-holder and short straight needles (Fig. 199) he first passes a silk thread through the edges of the wound, and draws after it the end of the wire, which is simply bent over. He uses a very stout silver wire, because it is less apt to cut through, and the sutures are applied at intervals of 1 cm. Before closure of the wound the wires are passed through the eye of a small plate, with a handle, which is pressed firmly against the edges of the wound. Bozeman then draws the wires through the openings of a lead plate 1 mm. thick (which is adapted to the special case) and whose concave side is applied to the coaptated edges. Finally, each wire is passed through a perforated grain of shot and fastened by compressing the shot. We have employed Bozeman's method in two cases with tolerably satisfactory results. But it does not effect any more than simple sutures, and its application requires favorable wound conditions, which in turn necessitate a tedious preparatory treatment.

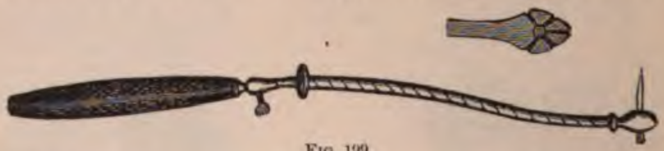

FIG. 199.

In complicated fistulæ the great advantage of numerous superficial and moderately deep assisting sutures is lost, and the covering lead plate prevents us from making subsequent corrections. Other methods than that of transverse union are excluded. The early removal of the plate (on the seventh day) is also an evil, since a certain degree of traction on the edges of the wound is almost unavoidable. Bozeman himself fears that the longer application of the plate may cause pressure-necrosis of the edges of the wound and cutting out of the sutures. It is often impossible to find the wires after removing the plate. They slip into the bladder and may form the nucleus of a calculus.

MODIFICATIONS OF THE OPERATION UNDER SPECIAL CONDITIONS.

In large fistulæ or severe hemorrhages it may be advantageous to perform the operation, not in stages, but in sections, *i.e.*, one part of the edge of the fistula is denuded and then sutured; then this is repeated with a second section, etc. In very difficult cases the operation may even be performed on two or three different days.

If there are several fistulæ, their size and distance from one another determine the mode of operation. Two small vesico-vaginal fistulæ, which are separated by a thin bridge of tissue, may be converted into a single one. This shortens the operation and renders it possible to make the edges of the wound uniformly broad. Larger and remote fistulæ must be operated separately in one or more sittings.

Vesico-vaginal fistulæ are complicated quite often with atresia of the urethra. (7 per cent. of Simon's cases.) Simple atresia of the urethra may be treated in two ways. It may be rendered permeable by the penetration of a trocar, and the introduction of successively larger bougies, or the obliterated part is excised and the healthy portions of the vesico-vaginal and urethro-vaginal septum are united in a transverse direction (bridging of the atresia.)

Bridging of the atresia seems to give better results with regard to the restoration of continence than perforation, but it is only applicable in narrow atresiæ and when the open portion of the urethra is sufficiently long. In cases of very extensive atresia or complete destruction of the urethra, Baker-Brown endeavored to form an entirely new canal alongside the obliterated one by perforation with a trocar and permanent introduction of canulæ.

In atresiæ which are situated between a urethro-vaginal and vesico-vaginal fistula, the operation depends chiefly on the size of the vesical and its distance from the atresia or urethral fistula. If the vesi cal fistula is situated immediately behind the atresia and the latter is short, both fistulæ are converted into a single one with the knife, and then joined in a transverse direction. But if the vesical fistula is situated in a higher part of the vesico-vaginal septum, far removed from the atresia, the latter may be excised first, the vesico-vaginal septum bridged to the permeable part of the urethra by transplantation, and later the vesico-vaginal fistula operated separately. Kolpokleisis may become necessary in very broad atresiæ of the urethra in which bridging fails.

In very extensive or total destruction of the urethra the conditions for direct plastic restoration by denudation of the lateral edges of the fistula, are very unfavorable. The firm adhesion of the urethra and surrounding parts of the posterior wall of the symphysis prevents sufficient mobility of these parts toward the median line; in addition the wall of the urethra itself presents extremely scanty tissue for denudation. The attempt has been made to form a new urethra by transplantation of flaps. Billroth made two lateral flaps from the tissue of the nymphæ and introitus; flaps have also been made from the posterior and even the anterior wall of the vagina. But the results were not very satisfactory, and it was necessary in several cases to construct complicated mechanical apparatus to aid retention of the urine. Lawson Tait[1] met with better success, but it remains doubtful "whether the smooth muscular fibres utilized in the plastic operation had formed a sphincter," or whether a mere valvular occlusion was produced.

The observation that vesico-vaginal fistulæ, which extend deep into the urethra, heal with much greater difficulty than those situated higher, has led Emmet and other operators to secure for the urine, until the closure of the fistula, another channel of escape than the urethra. Thus, in a vesico-urethral fistula, which had lasted fourteen years, Lawson Tait made a new canal by pushing a trocar from the vagina into the bladder, and kept it open with canulæ until the fistula was closed. Werth adopted another plan in a complete transverse section of the urethra extending to the bladder. He attempted to make a closed urethral canal by denuding on the sides, as in Emmet's operation, and then united with catgut the gaping halves of the urethra. As the result of a diffuse phlegmon, however, almost the entire urethra was destroyed, so that merely flat, unyielding cicatricial tissue remained below the symphysis. After fruitless attempts with urinals and tampons, Werth made a vesico-abdominal fistula, then closed the vesico-vaginal opening, and provided the new-formed fistula with a suitable apparatus for permanently carrying off the urine. After a time, however, suppurative calculous pyelonephritis set in, and the patient died.

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[1] British Medical Journ., 1870, I., 332, and Lancet, July 22, 1876.

DIRECT CLOSURE OF VESICO-VAGINAL FISTULÆ BY CAUTERIZATION.

In recent times Nélaton has employed the galvano-cautery, and K. Braun the glowing carbon rod. Some cauterize only the edges (intra-fistular cauterization), others cauterize also the vicinity of the fistula (peri-fistular cauterization), in order to produce concentric cicatricial retraction. Soupart perfected peri-fistular cauterization into the peri-fistular-centripetal, by performing each successive cauterization in narrower rings. Finally, the vicinity of the fistula has also been cauterized from the bladder. The combination of cauterization with suture has been referred to above.

Cauterization is entirely useless in large, cicatrized fistulæ. Intense applications, especially with the actual cautery, are injurious. They destroy a good deal of tissue and convert the edges of the fistula, over a wide area, into rigid, unyielding cicatricial tissue. Subsequent trials with paring and sutures are thus made much more difficult. A favorable effect may only be expected in small fistulæ, especially those with granulating, not too narrow, edges. These conditions are fulfilled in recent fistulæ during childbed or in the small fistulæ which are left over in the line of union, or as suture openings after an operation. In cicatrized fistulæ the cautery can not prove successful unless the fistula is a narrow, twisted or oblique canal, at least 1 cm. long, such as is found particularly near the uterus or in the anterior cervical wall itself. The narrow lumen of such a canal is closed to the urine by the eschar, until the proliferating granulation tissue unites. It is best to use only the solid stick or a sharp and narrow actual cautery. If cauterization does not prove rapidly successful, it should be discontinued after a little while, or the chance of the subsequent bloody operation will be lost.

CLOSURE OF THE GENITAL CANAL BELOW THE FISTULA.

Vidal de Cassis attributed the failure of direct closure of fistulæ to the non-distensibility of the bladder, and therefore purposed making a larger reservoir for the urine. He closed the lowermost parts by uniting the vulva in a sagittal direction (episiostenosis), but small openings in the region of the urethra or suture openings always remained. Simon and Bozeman readopted this operation in a more useful form. Simon closed the vagina itself in a transverse direction (kolpokleisis). Jobert closed even higher parts of the genital canal. In certain fistulæ he stitched the posterior lip of the cervix to the lower edge of the fistula (*vide* Fig. 183) and in vesico-uterine fistula he even closed the lips of the cervix (hysterokleisis.)

Indications for episiostenosis and kolpokleisis.—Episiostenosis need only be considered when the urethral wall is lost entirely or in great part. We have explained above the bad outlook for direct plastic restoration. But even simple episiostenosis *i.e.*, closure of the vaginal entrance, while the urethra is left open, is unattended with success, because even if the operation is successful from a plastic standpoint, continence will not be restored properly on account of the absence of an urethral wall which is capable of closure. Rose endeavored to make the operation useful by combining closure of the vulva, *i.e.*, the entrance to the vagina and urethra, with the formation of a recto-vaginal fistula. In this operation it was intended that the sphincter ani assume the *rôle* of the missing sphincter vesicæ The operation has been performed by several surgeons with varying success.

The majority of the previously adopted indications for kolpokleisis have been considerably circumscribed. Thus, very large size of the fistula (if its edges are healthy and distensible) forms no sufficient indication, since we are almost always able to close the opening directly by complicated plastic methods, if the operation is performed in several sittings.

Inaccessibility of the fistula is an indication for kolpokleisis only when associated with other unfavorable conditions. These include extensive cicatricial degeneration of the edges of high fistulæ or those adherent to the bones, and the danger of accidental injury to important parts in the vicinity. Thus, the peritoneum is very easily injured in deep vesico-utero-vaginal fistulæ with extensive destruction of the anterior cervical wall.

In many cases the necessity of kolpokleisis only becomes evident after unsuccessful attempts at direct closure of the fistula. For example, the vesico-uterine artery, ureters or peritoneum have been cut while paring the edges of the fistula, and severe hemorrhages occurred during the operation itself or repeated secondary hemorrhages into the bladder. In other cases symptoms of urinary stasis or peritonitis set in, because the ureter was included in the sutures, or because the abdominal cavity was infected by the entrance of urine. Even without these complications repeated failures with direct closure of the fistula may lead to kolpokleisis, because the tissues at our disposal for paring the edges have been gradually used up.

Simon has performed kolpokleisis repeatedly in very broad atresiæ of the urethra, situated between two fistulæ, in which bridging or transplantation did not appear feasible or had failed.

In vaginal stenoses at the level of the fistula or immediately below it, the fistula may not infrequently be exposed for the operation of direct closure by preparatory dilatation of the vagina. In many of these cases, however, kolpokleisis is necessary because the cicatricial masses around the stenosis are too extensive and firm. If the uterine cavity communicates with the vagina and bladder above the stenosis, there is no special contra-indication to closure of the vagina.

It is an important question whether, in view of the danger of hæmatometra, kolpokleisis should be performed in those cases in which a free communication between the uterine cavity and the vagina or bladder, above the stenotic ring, is doubtful or assuredly not present. The absence of menstruation or menstrual colic before the operation is no certain indication that a hæmatometra may not form after closure of the fistula or of the vagina below the fistula. Menstruation remains absent very often during the existence of a fistula, but returns not infrequently after its closure or after kolpokleisis. If the uterus or fornix is adherent, an hæmatometra must then develop. But this event appears exceedingly improbable, because the extensive lesions, which give rise to complete obliteration of the cervical canal or vagina, usually lead to other changes in the uterus and its appendages which interfere with or prevent the occurrence of menstruation. The uterus becomes atrophic, or is imbedded, together with the tubes and ovaries, in old inflammatory products. We know of only one case (reported by Schwarz) in which retention of blood after operation for fistula was demonstrated. Even in this case it is a question whether the hæmatometra was not present before the operation; moreover, the operation was not a kolpokleisis but direct union of the edges of the fistula. We have performed kolpokleisis repeatedly in extensive vaginal stenosis and amenorrhœa, without being able to obtain a clear notion with regard to the condition of the uterus. In two of these cases menstruation through the bladder set in soon after the operation; in the others, the menses remained permanently absent. If an hæmatometra should develop after the operation, separation of the vaginal closure, opening of the atresia, and a new plastic operation would be indicated. If necessary, the evacuation of the hæmatometra through the bladder might be taken into consideration.

Performance of Episiostenosis.—The simplest method of episiokleisis consists in paring a ring of tissue, 1 cm. broad, around the introitus from the meatus of the urethra to the posterior commissure, and uniting the raw surface from the sides, corresponding to the natural elongated shape of the vulvar fissure.

In *obliteratio vulvæ rectalis* the artificial recto-vaginal fistula is first made, 2 to 3 cm. above the anus, *i.e.*, immediately above the sphincter. Autal made it above the narrower portion of the vagina, where an intact portion of the anterior vaginal wall is applied to the posterior wall. He hoped that this part would be applied like a cover to the fistulous opening and would prevent the constant trickling of urine into the rectum. At the same time this valve was intended to prevent the entrance of fæces into the bladder. Cazin made the fistula by passing a metallic wire transversely through the recto-vaginal septum and simply contusing the included tissues. Czerny made an opening with a trocar and dilated the opening laterally. A much better method is a simple transverse incision, followed by stitching of the mucous membrane of the rectum and vagina. Kaltenbach protrudes the posterior vaginal wall from the rectum and cuts transversely upon the finger. Fritsch, on the other hand, protrudes the anterior rectal wall from the vagina and excises a small piece of tissue.

The episiokleisis may be performed in the same sitting. Before tying the sutures the future vaginal urinary reservoir must be carefully disinfected and dusted with iodoform. The prolonged action of the latter ises the best security against subsequent infection of the line of union the inside. This is so apt to result from the decomposed urine or les of fæces, that the majority of operators have been successful after a series of subsequent operations. Despite the stitching of the us membrane the rectal fistula exhibits a marked tendency to

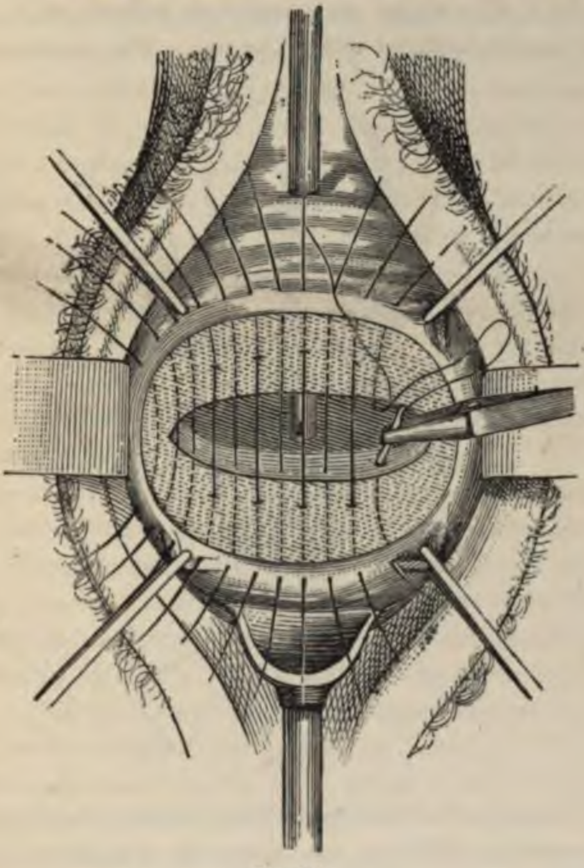

FIG. 200.

ne narrower, and must be dilated, when necessary, with the finger or ments.

lpokleisis may be performed in the urethral, vesical or fornix por- of the vagina. As a rule, it should be performed as high as possible ler to avoid unnecessary shortening of the vagina. Moreover, the nty of plastic success seems to be greater in the higher parts of the than in the lower portions, because less tension need be overcome.

A ring of tissue, about 3 mm. thick and 1.5 to 2 cm. wide, is dissected out below the fistula, and the raw surface of the anterior vaginal wall united to that of the posterior wall (transverse obliteration). The patient lies on the side or in the breech-dorsal position. The introitus and lower part of the vagina are separated by a bivalve speculum and lateral depressors. In a wide vagina with numerous folds we try to find those parts which can be coaptated without tension. The anterior or posterior vaginal wall is grasped in transverse folds in various places with forceps, and their elasticity, thickness, etc., compared with those of the corresponding folds on the opposite vaginal wall. In this way the entire circumference of the vagina is tested and the field of operation is then exposed. The boundaries of the ring of tissue which is to be excised are first mapped out by a shallow incision at the base of the lifted folds, the lower free edge of the latter is then grasped with forceps, and denuded from below upwards. An assistant may aid the operator by keeping the ring of tissue tense with a second pair of forceps. Further aid is secured by projecting and stretching the anterior vaginal wall by means of a

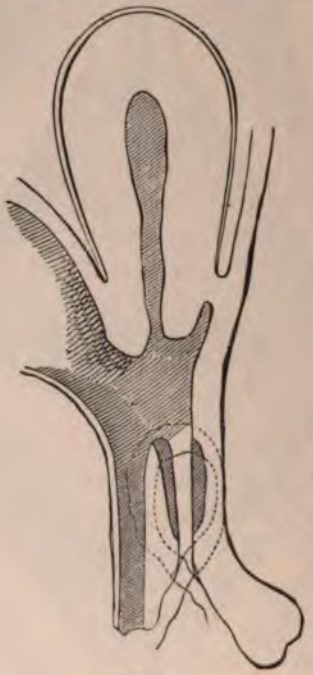

FIG. 201.

catheter, or the posterior vaginal wall by means of a finger in the rectum. We can thus guage the thickness of the walls much better, and avoid accidental injuries. After freshening, the wound is smoothed with a pair of scissors. The bleeding in the lateral parts of the vagina is usually quite considerable; it is checked in the manner previously described.

Short, curved needles, rarely needles with handles, are employed. The sutures should include the entire base (Fig. 201); they are best inserted on one side from below upwards, on the other side from above downwards. But both edges of the wound may be penetrated from above downwards if a needle is threaded at each end of the suture. The first suture requires special care, as it forms the starting-point for all subsequent ones; it must unite accurately corresponding wound edges of the anterior and posterior vaginal walls. By pulling on the first suture the entire field of operation is made more accessible and the application of subsequent sutures is considerably facilitated. The sutures are introduced at distances of 3 to 4 mm. In general the sutures should run within the vaginal walls, but it will be difficult to prevent the entrance of some of them into the bladder, urethra or rectum.

In stenosis of the vagina kolpokleisis is much simpler, on account of the narrow field of operation. The denudation is performed somewhat below the stenosis because we are then more certain of operating in healthy tissue, and are better guarded against injury to the peritoneum. Douglas's sac has been injured in several cases while denuding the projecting posterior edge of a high vaginal stenosis. The injury is easily recognized by the sudden appearance of a sharp bordered opening, covered by a smooth membrane, and from which a few drops of ascitic fluid escape. The peritoneal wound is closed forthwith with sutures, but the operation need not be interrupted.

In the case of a fistula, as large as a cherry, which was situated in the right vaginal fornix, Simon modified the operation by making a partial oblique closure of the vagina instead of the ordinary transverse obliteration; the right half of the fornix alone was occluded while the vagina on the other side was left intact.

Bozeman and others claim that kolpokleisis gives rise to stagnation an decomposition of the urine in the newly formed urinary reservoir, an thus to the formation of calculi and finally to suppurative pyelitis. It true that all these bad effects may occur, but they appear to be due, great part, to preventable causes and therefore should not be attributed to the operation itself. They are observed particularly when diseases of the urinary passages were present before the operation, but their treatment and proper disinfection of the bladder and vagina during the operation had been neglected; also, when the opening of communication is narrow and when the sutures are removed carelessly, so that some of them slip back into the urinary reservoir and form nuclei for calculi.

In one case Neugebauer reopened the vaginal closure to remove a large calculus which had formed in the bladder and vaginal diverticulum, and later reclosed it. Among ten cases Simon did not observe any suppurative pyelitis within five to ten years, and our own experience has also been very favorable.

Kolpokleisis entails sterility, but, as a rule, does not interfere with the other functions of the sexual organs. The menses escape through the bladder, and sometimes return although they had been absent before the operation. Temporary catarrh of the bladder is observed occasionally during menstruation.

Cohabitation is not disturbed by closure of the higher parts of the vagina. But some patients were so little satisfied with their condition (despite the relief of the incontinence) after kolpokleisis in the urethral portion that they demanded the reopening of the closed vagina. In a case of this kind Simon attempted plastic elongation of the vagina. He dissected a quadrangular flap, with the base directed towards the atresia, from the posterior vaginal wall, and then penetrated 1.5 cm. higher, behind the atresia, in the cellular tissue between the vagina and rectum. The vaginal flaps were then folded into this artificial elongation of the vagina and pressed against the anterior wall of the new formed tube by sutures and a tampon of charpie. Recovery occurred and the vagina was made 1.5 cm. longer.

In two women, who had been operated upon by other surgeons, Simon found by examination through the dilated urethra that the fistula was comparatively small. He divided the artificial atresia, cut the overlying constricting bands of cicatricial tissue, and closed the fistula directly.

The results of episiokleisis with formation of an artificial recto-vaginal fistula are less favorable. The restoration of continence is not so certain, and the operation is attended with much greater dangers to the urinary organs. If the opening in the bladder is very large and the recto-vaginal fistula does not close like a valve, the urine flows into the ampulla of the rectum as rapidly as it is secreted; the patients complain of constant tenesmus and the discharges of flatus are moist. The condition of the patient is almost as distressing as before the operation. But if the closure is valvular, the vesico-vaginal urinary reservoir does not discharge into the rectum until it has attained a certain degree of fullness. A desire to evacuate, which is located by the patient behind the symphysis and in the vagina, is felt every two, three or four hours, and must be rapidly satisfied. The most favorable cases are those in which the bladder itself is partly continent, because the injury is confined chiefly or exclusiveyl to the urethra. Despite the originally valve-like closure, particles of fæces and intestinal gases enter the vaginal urinary reservoir after a time, especially if the fistula becomes distended. Thev give rise to decomposition which, apart from its deleterious action on the urinary organs, may give rise at a later period to rupture of the perineal cicatrix. The latter accident may also result from marked constriction of the recto-vaginal fistula and hence stasis in the urinary reservoir. These symptoms may not develop until a considerable time after the operation, so that the prognosis with regard to the final result should be guarded. In Czerny's case he was compelled to reclose the recto-vaginal fistula because the patient, after rupture of the perineal cicatrix, suffered more from this fistula than from the primary urinary fistula.

After "*obliteratio vulvæ rectalis*" the menses escape through the anus, and may return after the restoration of continence although they had remained absent for years. In favorable cases the bowels are usually constipated.

TREATMENT OF VESICO-UTERINE FISTULA.

Two methods may be adopted, *viz.*, direct closure of the fistula by suture or cauterization, and closure of the os uteri below the fistula (hysterokleisis). Jobert adopted the former method in 1849, but since then he and almost all his followers have employed hysterokleisis almost exclusively. But the latter operation is attended with so many disadvantages that direct closure of the fistula is to be preferred whenever feasible. With few exceptions hysterokleisis causes sterility, and this is so much more serious inasmuch as the narrowing of the pelvis is usually not at all marked. In addition severe menstrual colic often occurs, because the opening between the bladder and cervical canal is usually very narrow; the closed os uteri has repeatedly yielded to the violent uterine contractions.

When the fistula is situated high up or the portio is intact, great difficulties are also experienced in direct closure with sutures. Among seven

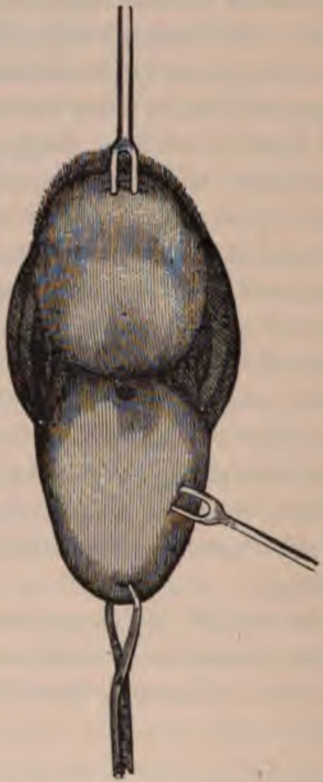

FIG. 202.

cervical fistulæ Spiegelberg attempted direct closure only once; a small fistula was left over, and required cauterization.

In Kaltenbach's case he divided the lips of the cervix (the patient being in lateral decubitus) beyond the vaginal insertion, everted them forcibly with hooks, and drew them into the lower third of the vagina. Fig. 202, drawn from nature, shows the position of the fistula. A disturbing fold on the anterior cervical wall was drawn down by a hook. Steep, oblique, sufficient denudation of the fistula longitudinally, closure by seven sutures; difficulty in removal of the latter, because the lateral incisions had healed in great part.

Simon, Spiegelberg and Lossen were able to expose the fistula without dividing the os. Lossen and Martin dragged it down by means of a catheter passed through the urethra.

Simpson, Spiegelberg and Polaillon have produced recovery by cauterization with the actual cautery or solid stick.

Spontaneous recovery has also been observed repeatedly.

With the exception of the cases mentioned above, all operators have employed Jobert's hysterokleisis exclusively. Jobert himself reported thirteen cases with eleven recoveries.

The technique of the operation is very simple: the edges of the os uteri are pared as widely as possible in a steep oblique direction, and united from before backwards so that the line of union is transverse. The operation offers very favorable chances for recovery, inasmuch as very broad raw surfaces, which fit well to one another, may be produced (*vide* Fig. 188).

TREATMENT OF URETERO-VAGINAL AND URETERO-UTERINE FISTULÆ.

Simple union with sutures is impracticable in uretero-vaginal fistulæ on account of the extremely thin edges of the fistula and the narrow calibre of the ureter; moreover, the vesical end of the ureter is almost always closed. Simon's attempts to make the closed vesical portion of the ureters permeable, and then to close the fistula, failed, inasmuch as the opening in the ureters, which was too narrow, closed, and the closed vaginal fistulà reopened. At the same time the operations were accompanied by alarming symptoms of retention of urine, violent renal pains, frequent vomiting, high fever, etc.

It was long held that the incontinence could only be cured in an indirect way. An artificial vesico-vaginal fistula was to be made, and then kolpokleisis performed below this part, the lower edge of the new-formed fistula being utilized, if necessary. But the favorable results obtained from slitting of the ureter in vesico-uretero-vaginal fistula, and the possibility of making the bladder and ureters accessible through the dilated urethra, stimulated to renewed attempts at direct closure of uretero-vaginal fistulæ. Simon taught later that the wall of the bladder should be perforated at the site of the fistula, then a sound passed from the bladder through this opening into the ureter; upon this sound the uretero-vesical wall is slit (from the bladder) 1 to 1½ cm. upwards, and the edges of the slit separated daily with a thick sound, until cicatrization has set in. At a second operation the vaginal fistula, which is now remote from the new opening of the ureter, is denuded along its long diameter (together with a part of the adjacent fornix) and united.

Laudau proposed, on the other hand, that a long elastic catheter be passed from the vagina into the upper end of the ureter, its free end through the lower extremity of the ureter into the bladder, then drawn, by means of forceps, externally through the urethra. The patient being in the knee-elbow position, the vaginal mucous membrane is then freshened on both sides of the free portion of the catheter and with it the inferior wall of the ureter in an oblique longitudinal oval; this is united over the catheter which is allowed to remain for some time If this plan proves unsuccessful, a longitudinal oval is excised from the vesical and vaginal wall in the direction of the lower end of the ureter, and the direct uretero-vaginal fistula thus converted into an ordinary vesico-vaginal fistula into whose upper angle the ureter empties; finally, suture of this fistula with deep sutures which include the mucous membrane of the bladder. Bandl adopted a modified Laudau's operation in two cases, but recovery occurred only after several operations. In one case the vesical opening of the ureter was included in the sutures. This was followed by a protracted chill, and at the end of four hours the axillary temperature had risen to 42° C.; at the same time, severe pains in right renal region. It was necessary to remove the sutures. In one case Schede firs made a vesico-vaginal fistula by excising a piece of the mucous membrane of the bladder, 2 cm. square, in the direction of the normal course of the lower end of the ureter. The ureter fistula was concealed behind a fold of mucous membrane far to the side at the end of a groove-shaped, cicatrized fissure of the cervix. The artificial vesico-vaginal fistula was stitched over with mucous membrane like a lip, and thus guarded against subsequent narrowing; fourteen days later the vesico-vaginal fistula was closed. Introduction of an elastic catheter from the vagina into the ureter, on the other hand through the artificial fistula into the bladder and out through the urethra. Then shallow paring of the fistula with retention of a strip of intact vaginal mucosa (3 to 4 mm. wide) immediately around the fistula. In this way the edges of the fistula, which were covered with intact mucous membrane, were inverted towards the bladder and formed a semi-canal, lined with mucous membrane, into whose outermost extremity the ureter emptied. In the final operation, accordingly, there was no fresh injury to the walls of the ureter and the vesical mucous membrane, and the danger of cicatricial narrowing of the opening of the ureter into the bladder was reduced to a minimum. Finally, the furrow, which was open towards the bladder, offered a sure guide for treatment with sounds, if this should become necessary. Recovery after several accidents. In a second case, which was complicated with vaginal stenosis below the fornix, Schede performed kolpokleisis after the formation of an artificial vesico-vaginal fistula.

In uretero-uterine fistulæ the opening cannot be exposed and treatment must be indirect. Simple hysterokleisis is not admissible unless the vesical end of the ureter is open. Otherwise an artificial vesico-cervical fistula must first be made or an artificial ureter constructed, from the bladder towards the exposed cervical end of the ureter. Zweifel tried both plans in his case without success. Duclout alone secured complete recovery of the incontinence by simple hysterokleisis. He was encouraged to perform the operation from the fact that after temporary closure of the fistula from cauterization of the cervical canal, and after the introduction of laminaria into the os uteri, uræmic symptoms did not appear, and the vesical end of the ureter was therefore regarded as open. Perhaps, also, there was a second higher fistula leading from the ureter into the bladder.

In a case of uretero-uterine fistula Hahn first made an artificial vesico-vaginal fistula and then performed kolpokleisis below it. Spontaneous closure of the opening in the bladder was prevented by the introduction of sutures which included the vesical and vaginal mucosa at the upper edge of the fistula; the lower edge was united to the middle of the posterior vaginal wall. Complete recovery. Eight months later the vagina was reopened at the desire of the husband and the patient became pregnant. After childbed the uretero-uterine fistula could no longer be detected, while the artificial vesico-vaginal fistula was unchanged.

In 1878, after fruitless attempts with other methods and the refusal of the patient to submit to kolpokleisis, Zweifel extirpated the kidney corresponding to the injured ureter; complete recovery. Credé obtained equal success in a second case.

The following is a brief description of nephrectomy for the relief of fistulæ of the ureter in the female.

The patient is placed on the healthy side upon a thick pillow, so that the edges of the ribs are widely separated from the crest of the ilium on the side of the operation.

Incision through the skin at the outer border of the sacro-lumbalis muscle from the eleventh rib to near the crest of the ilium, and 6.5 to 7 cm. from the spinous processes of the vertebræ. After division of the sub-cutaneous cellulo-fatty tissue the superficial lumbo-dorsalis fascia is exposed. In dividing the latter a few fibres of the latissimus dorsi are also incised, as a rule, in the upper angle of the wound. The edge of the sacro-spinalis muscle is now exposed. The ileo-hypogastric nerve and a blood-vessel are divided and we come in contact with the deep lumbo-dorsalis fascia. This is cut at the border of the sacro-spinalis, whereupon the fibres of the quadratus lumborum, which run upwards and inwards, become visible. The incision through the aponeurosis must here be prolonged to the angle formed between the twelfth rib and the sacro-spinalis muscle. Beneath this aponeurosis is found the ileo-inguinal nerve, which is divided. After the quadratus lumborum is drawn towards the median line with a muscle tenaculum, the lower border of the kidney can be felt in the angle between the last rib and the common extensor of the back. It is still covered by the transverse fascia, which is first nicked in the upper angle of the wound and then slit completely along the inserted finger. Beginning at its lower end the kidney is now enucleated with the fingers from its capsule. This is extremely difficult on account of the lack of room, especially if the abdominal walls are very fat or the patient thick-set, and the twelfth rib is sometimes resected in order to gain more room. The difficulties in enucleation increase the further we advance upwards, and finally it may become necessary to pull upon the organ. This must be done with extreme caution, as the brittle tissue is apt to tear and to give rise to extremely profuse hemorrhage. Zweifel was finally compelled to grasp the kidney with Nelaton's forceps. Credé had to use the knife in separating the upper and lower ends of the kidney, which were adherent to the peritoneum.

After the removal of the kidney the vessels and ureter are tied in bundles with silk ligatures *en masse* or with a single elastic ligature; the threads are cut short. A few drainage tubes are inserted deep into the wound and the tissues coaptated as much as possible by deep sutures.

AFTER-TREATMENT.—ACCIDENTS AFTER THE OPERATION.—PROGNOSIS.—SUBSEQUENT CONDITION OF THE PATIENTS.

At present, the wound, which is dusted with a little iodoform, is left entirely at rest until the removal of the sutures. Vaginal injections are only made under special circumstances. A catheter is introduced every two to three hours, so long as the patient is unable to pass urine voluntarily. The diet should be easily digestible, and the bowels should be moved daily.

As a rule, the patients are kept in bed eight to ten days, but the favorable results of Meadows, Schuppert and Simon, who allowed their patients to rise immediately after the operation or at the end of two or three days, shows that this precaution is not absolutely necessary.

Silk sutures are removed on and after the eighth day, wire sutures may be retained for weeks. The failure of the operation is shown by febrile movement, and, at the end of three or four days, the urine again escapes through the vagina. In some cases the failure is not recognized until the patient gets out of bed or until removal of the sutures; the vicinity of the wound is then covered not infrequently with a croup-like membrane, incrusted with urinary salts. If small openings in the line of union or suture openings alone are left over, recovery is often possible by cauterization with nitrate of silver or the actual cautery. But the patients must again take to bed when this is done. The patients may retain the abdominal or lateral position if they notice that, in this position, less urine is lost through the vagina or they remain perfectly dry. If these measures prove useless, another operation must be performed at the end of two to three weeks.

COMPLICATIONS AFTER THE OPERATIONS.

Catarrh of the bladder occurs not infrequently during the first few days, especially if catheterization was performed frequently or the catheter was retained permanently. This may interfere with union by first intention on account of infection of the wound or spasm of the bladder. The chief point is to dispense with the catheter as soon as possible, as the disease, as a rule, then disappears spontaneously. This may sometimes be done by allowing the patients, who cannot urinate in the horizontal position, to sit up or even stand at an early period. Vichy water is given. Spasms of the bladder, which may result from secondary hemorrhages, inclusion of the vesical mucosa in the sutures or the use of improper disinfectants, are relieved by opium enemata or injections of morphine.

Secondary hemorrhages into the bladder or vagina may occur soon after the operation or on the third to fifth days. This is always the result of an error of technique. Vaginal hemorrhages are checked by hot injections, the tampon or fresh ligatures.

Hemorrhages into the bladder are much more serious, especially if they come from larger arteries. They may become dangerous, so that the bladder is distended to the umbilicus and all the symptoms of profound anæmia appear. The blood causes painful vesical spasms, but despite violent straining, only small quantities of dark red urine are discharged. It is not until the following days that small clots, mixed with brownish red or greenish red urine, are discharged through the urethra or between the edges of the fistula. The success of the operation is almost always prevented in this way, and the patients recover very slowly from the loss of blood.

In moderate hemorrhages an ice-bag is applied and the spasms relieved by narcotics. So long as large clots remain in the bladder, cold injections increase the tenesmus without checking the hemorrhage to any notable extent. Artificial removal of the clots by expression or suction with a large catheter has been tried in several cases. Such procedures require preliminary dilatation of the urethra, and the wound is thus exposed to great danger. If the hemorrhage is considerable or is supposed to come from a larger artery it is best, if the position of the vessel is known to a certain extent, to ligate it from the vagina or to search for it in the reopened wound and ligate forthwith.

Infectious surgical diseases, such as erysipelas, lymphangitis, peritonitis, diphtheria, pyæmia and septic venous thrombosis were much rarer, even in the præ-antiseptic period, than after other operations, so that the opinion is forced upon us that the constant irrigation of the wound with urine offered a certain degree of protection against infection. With our present antiseptic precautions primary infection no longer occurs, or, at least, its source can be ascertained. At the present time febrile wound diseases are almost always secondary infectious processes. Decomposition of blood or urine occurs in the vicinity of the wound or in the urinary organs. Suppuration ensues in the pelvic cellular tissue and lymphatics; sometimes a late infection of the peritoneum is produced in this manner. These cases usually result from self-infection from the vaginal secretions or from old purulent catarrhs of the urinary passages, or there was also some error in the technique of the operation. Perhaps hemorrhages or urinary infiltration occurred into the loose subserous cellular tissue, because the opened cellular tissue spaces were not closed accurately by sutures.

Calculi are found not infrequently in the bladder at the end of a few weeks or months after the operation; they are manifested by pus and blood in the urine and by annoying tenesmus. They result from the deposit of urinary salts (phosphates) on bits of thread or wire which have been overlooked, more rarely on pieces of sponge which had been placed in the bladder during the operation. On account of their soft consistence they are easily crushed with forceps; small ones may be removed intact through the urethra.

The danger to life in operations for fistula is extremely slight if proper antisepsis is adopted. At the present time danger results only from unfavorable anatomical conditions, in which the peritoneum or larger arteries are injured or the ureters are included in the sutures, or in complicating diseases, especially suppurative pyelitis.

Jobert de Lamballe's great mortality (26 deaths among 147 cases) was due to the bad hygienic condition of the Paris hospitals and to his dangerous tension-diminishing incisions. Simon, the greater part of whose operations were performed in the præ-antiseptic period, lost 4.4 per cent. of his patients. Spiegelberg lost one case among sixty, Hegar and Kaltenbach not a single one among more than eighty cases. Nor were any fatal results observed among the large series of operations by Bandl, Pawlick, Czerny and Fritsch. The great importance of strict antiseptic measures is shown by the unfortunate experience of Verneuil. Among eighty cases five died of peritonitis, in part after simple operations; another patient died, without operation, of pyelonephritis and thrombosis of the femoral veins. In addition, erysipelas and phlegmasia alba dolens occurred, and, in one case, "violent herpetic fever" after exploration of a recently operated fistula.

The plastic result of operations for fistula with our present aids is almost certain. Among forty-two of the most complicated fistulæ which Simon operated upon from 1852 to 1868, in only one was complete union not attained. Among the patients operated upon by Hegar and Kaltenbach, in Freiberg and Giessen, two alone were uncured. One refused treatment after the first unsuccessful operation. In the second case, which was complicated with a large opening in the recto-vaginal septum, Simon had performed a remarkable transplantation of flaps from the external integument as a preliminary operation; three subsequent operations by Hegar were unsuccessful.

Continence, on the other hand, is not always restored completely, even if union has been accomplished. This happens if the bladder has lost its distensibility on account of cicatricial retraction, or too large a piece of the urethra and neck of the bladder has been destroyed, or its function impaired by cicatricial degeneration or paralysis. If closure of the bladder were effected solely by the internal sphincter vesicæ, incontinence would be left over more frequently after the operation. But this function is also performed in part by the muscular fibres in the urethral wall itself; these surround only the upper half of the urethra like a ring, while below they occupy only a part of the wall, especially anteriorly. The importance of these fibres is best illustrated in those cases in which, although the neck of the bladder is destroyed, a portion of urethra 2 cm. or even only 1.5 cm. in length suffices to preserve continence.

Hardly anything can be done to relieve the incontinence left over after union has been effected. Imperfect results have been obtained from injections of strychnine, the application of electricity or even the formation of a new urethra (Baker Brown). In a case in which the urethra was dilated Frank excised a wedge from the posterior urethral wall, which terminated 1 cm. from the external orifice. Above the region of the internal orifice the vagina, in its entire thickness, was denuded in an elliptical shape, so that the greater axis of the ellipse was situated in the region of the internal orifice. By stitching together the edges of the wall from the sides it was intended to make a ridge projecting towards the lumen of the urethra and bladder, like the third lobe of an hypertrophied prostate. Good results were obtained. Merhart restored continence by dividing a cicatricial band which had prevented juxtaposition of the lower and upper urethral walls. If the incontinence depends on imperfect distensibility of the bladder, recovery is sometimes effected by methodical, gradually increased filling of the bladder in the knee-elbow position. If all methods fail, the patient must wear a urinal or obturator, which relieves the incontinence by compression of the urethra against the symphysis. Schatz has devised a funnel pessary whose upper, wider ring rests on the levator ani, while the lower, narrower one is situated in the introitus. Rutenberg's proposition to close the old urethra and to make a new one, *i.e.*, a vesico-abdominal fistula above the symphysis (because this is closed more readily by a pad) is well worthy of consideration (*vide* page 215).

The incontinence remaining after closure of the fistula is rarely complete. The patients can generally retain the urine in certain positions or up to a certain degree of fullness of the bladder, but are then compelled to relieve themselves quickly.

In rare cases ischuria remains after the cure of the fistula. This occurs if, in binding an urethral atresia, the vesical mucous membrane is stitched to a portion of the urethra which is adherent to the posterior surface of the symphysis, and the line of union projects at an angle into the lumen of the urinary passage (Fig. 203). The ischuria has been known to disappear after using the catheter for months (Simon).

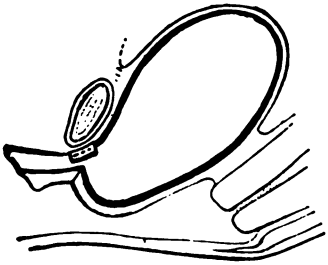

FIG. 203.

Operative Treatment of Intestino-Vaginal Fistulæ.

Communications between the vagina and small intestines occur as anus præternaturalis vaginalis and as fistula stercoralis vaginalis, s. ileo-vaginalis. The former develops if, after rupture of the cervix or the posterior fornix during delivery, loops of the small intestine descend spontaneously or on traction through the opening, and, after adhesion of their peritoneal covering to the edge of the opening, are exfoliated in a gangrenous condition. The continuity of the gut is interrupted over an entire loop, sometimes several feet in length. Into the posterior fornix empty two intestinal openings, whose septa, which have coalesced over a certain area, separate the two ends of the intestine like a spur. According to the larger or smaller angle between the two ends of the intestine, the spur will interfere partly or entirely with the passage of fæces from the upper to the lower end of the intestine. In the cases hitherto observed the destroyed portion of the intestine belonged to the lower part of the small intestine, so that usually a piece six to eight inches long alone remained before its entrance into the large intestine. The lower part of the intestine, which no longer functionates, gradually narrows. In Casamajor's case it was converted into a solid band, so that only one intestinal opening was found in the fornix of the vagina. The patient herself had ligated the prolapsed loop of intestine. The vagina is often stenosed as the result of injury during delivery, and, like the external genitals, is inflamed and ulcerated from constant contact with fæcal masses.

Intestino-vaginal fistulæ, in the narrower sense, arise from the perforation, into the vagina, of a loop of intestine which had been adherent in Douglas's sac. This results generally from intra-peritoneal abscesses which rupture in both directions. The opening into the intestine is merely in its walls, so that some of the fæces may pass into the lower part of the intestinal tract.

The following operations have been recommended or performed in anus præternaturalis:

1. The upper end of the gut is transplanted into a lower portion, into the colon or rectum, and the passage of fæces through the vagina is thus avoided. Roux performed this operation. He opened the abdominal cavity, separated the upper angle of the anus præternaturalis from its connections with the vagina, inserted it into a new opening in the large intestine and united them around their entire circumference. The patient died of peritonitis. Jobert suggested that the upper end of the intestine be inserted into an opening in the wall of the rectum. Both plans possess merely an historical interest.

2. A wide opening is to be made between the rectum and vagina, and the latter occluded below this part (Simon). In this operation the peritoneum would not be opened, but a large part of the intestine would be prevented from exercising digestive functions. The portion of the vagina

introduced between the small intestine and rectum would hardly be adapted for the transportation of fæces; it might also be difficult to keep the recto-vaginal fistula open from the rectum.

3. The vaginal anus is first converted into a fæcal fistula, and its closure either left to nature or effected by sutures or cauterization. Casamajor attempted to make a wide connection between the upper end of the small intestine and the rectum, outside of the vagina. He used a curved enterotome whose blades were provided with plate-shaped ends. One blade was passed through the vagina into the end of the small intestine, the other into the rectum, and by closing them the intestinal walls between them were first made to adhere and then to perforate from pressure-necrosis. A wide communication was thus made between the intestine and rectum, but the expected spontaneous closure of the vaginal opening of the intestine did not take place, and its artificial closure with an obturator also failed.

O. Weber was the first to convert the vaginal anus into a fæcal fistula by producing a communication between both loops of the small intestine. Heine perfected the operation by uniting the edges of the fistula with sutures. We will give a brief report of this unique operation. The anus præternaturalis emptied by two separate openings, through which the intestinal mucosa protruded, high up in the posterior fornix, to the right of the ruptured external orifice of the uterus. All the fæces discharged through the median opening. The vagina was stenosed, and, like the external genitals, excoriated. Introduction of an elongated Dupuytren's enterotome, provided with a pelvic curve, into both intestinal lumina (Fig. 204). On the third day after introduction of the scissors fæces passed, for the first time since the beginning of the disease, through the anus. On the sixth day the enterotome, which had become loose, could be easily removed. A week later violent pain in the abdomen. Examination with the speculum showed that both openings had been converted into one large one, through which the opposite intestinal wall projected in such a way as to cause valvular closure of the upper part of the small intestine and thus retention of fæces. After pushing back the prolapsed intestinal wall with a sponge attached to a handle, a copious evacuation of fæces occurred. Peritonitic symptoms. A month after the introduction of the enterotome an attempt was made to make the fistula smaller by cauterization with the actual cautery and tincture of cantharides. It diminished to the size of a half "gulden." Nine months later Heine again introduced the enterotome in order to divide the intestinal septum higher up. The fistula then diminished in size to the thickness of a finger, and an attempt was then made to close it with sutures. Funnel-shaped paring of the edges, on the median side into the posterior lip of the cervix. Excision of a strip of mucous membrane (1½ inches wide) of the adjoining intestinal and vaginal mucosa. After smoothing the transverse wound four sutures were inserted about one inch from the edge of the wound. Removal of the sutures on the ninth day. Small fistulæ were left at both ends of the wound; the lateral one closed spontaneously, the median one resisted repeated cauterizations. Repetition of the operation at the end of a few

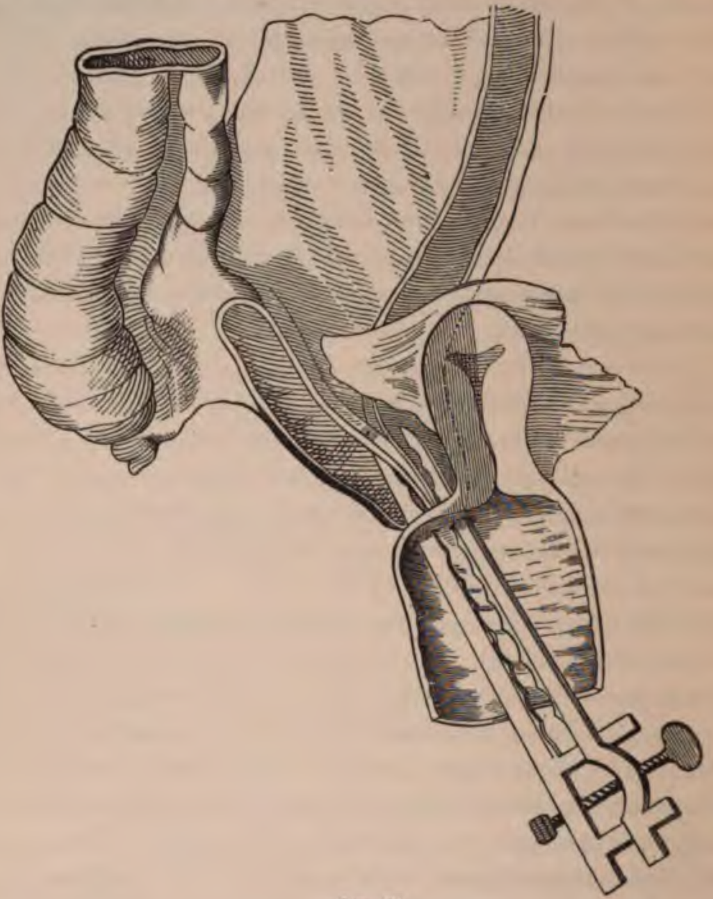

FIG. 204.

weeks; broader denudation which, anteriorly, involved especially the posterior lip of the cervix. Union by six deep and three superficial transverse sutures, the posterior lip of the cervix being folded backwards over the intestinal opening. Slight peritonitic symptoms. Complete recovery.

The patient died 1¼ years later of tuberculosis. The autopsy showed that the continuity of the intestines at the site of the former vaginal anus was intact. Merely moderate dilatation of the intestines above the former anus præternaturalis.

If this method did not prove successful, it would be necessary to perform laparotomy, separate the ends of the intestine from their connections, resect them and unite them with sutures.

Fistulæ of the small intestines not infrequently heal spontaneously under ordinary cleanliness. Cauterization with the solid stick or actual cautery has repeatedly cured small fistulæ. If this is unsuccessful, the fistula may be denuded and united with sutures. If the intestine is not adherent to Douglas's sac over a large area, the peritoneal cavity is very apt to be opened, but the evil results of such an injury may be avoided by exact closure with sutures. If direct union of the fistula appears impracticable or too dangerous, we may try to cover it with transplanted flaps from the vaginal mucous membrane, or, as a last resort, perform laparotomy and direct enterorrhaphy, with or without previous resection of the intestines.

Operation for Recto-Vaginal Fistulæ.

The recto-vaginal septum may be perforated by a fistula in any part, but the site corresponds in quite a typical manner to the mode of development.

In the lowermost part of the septum are found those fistulæ which are left over after incomplete cure of total perineal ruptures, or after perforation of foreign bodies which have stuck fast in the rectum. Somewhat higher, from 2 to 5 cm. above the anus, are situated the fistulæ produced by difficult labor. The pressure-necrosis then affects those parts of the septum which correspond to the soft floor of the pelvis or the bony exit of the pelvis, the tip of the sacrum and the coccyx. As diminution of space occurs much less rarely at the exit than at the entrance to the pelvis, and as the rectum higher up is guarded quite securely against injurious pressure by its course to the left of the promontory, and in the concavity of the sacrum, puerperal lesions of the recto-vaginal septum are much less frequent than those of the vesico-vaginal septum. The upper peritoneal portion of the septum is the site of those abnormal communications which result from double perforation (into the rectum and vagina) of encapsulated exudations in Douglas's sac or of extra-uterine pregnancies. Perforations by obstetrical instruments, injuries of other kinds, unsuitable pessaries or ulcerative processes, are not confined to any definite localities.

The size of recto-vaginal fistulæ varies from fine canals to openings which are so large that only a few centimetres of the septum remain above and below. But fistulæ whose longest diameter exceeds 1.5 to 2 cm. are rare. Their shape may be round, or that of an elongated or transverse oval; large fistulæ sometimes have a semilunar shape, with an upper concavity. The edges are usually thin and sharp, more rarely they are surrounded by cicatricial tissue or fixed by adhesions to the sacrum or coccyx. If the posterior columna rugarum is intact, deep-seated recto-vaginal fistulæ are situated outside of this firm muscular column, and are often covered by it as by a valve. In very large fistulæ the posterior wall of the rectum or even the sigmoid flexure may be inverted into the vagina and there undergo secondary adhesions. Breisky observed a high recto-vaginal fistula through which a ruptured dermoid cyst had prolapsed into the vagina.

Recto-vaginal fistulæ are often complicated with other diseases of the sexual organs, for example, vesico-vaginal fistula, stenosis of the vagina, rupture of the perineum.

Indications.—Our object is to prevent the passage of fæces and gases from the rectum into the vagina by restoring the recto-vaginal septum. Operative treatment is indicated in all forms of recto-vaginal fistula, with the exception of those resulting from cancerous ulceration. Those produced during delivery are best operated six to eight weeks after childbed; spontaneous recovery occurs not infrequently during puerperal involution. If the fistula is the result of other causes, complicating diseases, such as peritonitis and syphilis, must first be relieved or we must wait until the edges of the opening are clean or healed. During pregnancy the operation should not be performed unless the symptoms are very urgent. In Mauriceau's case premature delivery and death resulted.

METHODS OF OPERATION.

Cauterization and sutures have been employed in treatment.

In small fistulæ cauterization offers better chances than in vesico-vaginal fistulæ, because the great mobility of the septum favors the exact coaptation of the cauterized edges. In recent fistulæ, in suture perforations which have been left over, even in old fistulæ which are not larger than a pea, a trial may be made of nitrate of silver or the actual cautery.

In large fistulæ union with sutures alone is indicated.

Closure of recto-vaginal fistulæ may be performed from the vagina, rectum, and from the perineum, after dividing it below the fistula. The selection of the method of operation depends on the situation and accessibility of the fistula, and the results of previous operations.

Union from the perineum is indicated when complete perineal rupture is present in addition to a high recto-vaginal fistula,[1] and in fistulæ situated at the transition of the perineal into the supra-perineal portion of the septum, which, surrounded by radiating cicatricial masses, can only be exposed imperfectly by drawing down the perineum. Formerly, the perineum was only divided after other operations had failed because it was feared that it would not unite completely. But as this fear need no longer be entertained, poorly accessible fistulæ are operated upon from the divided perineum, even if the fistula is very small and the perineum very broad.

In uncomplicated fistula a closure from the vagina should first be tried.

As a rule exposure through the vagina is much easier than through the rectum, because the introitus is much larger than the anus, and sufficient retraction of the posterior rectal wall is prevented by the coccyx. In the vaginal operation the chief denudation takes place in the firm tissue of the vaginal wall, while in the rectal operation, the movable and vascular mucosa pushes in folds into the incision in an annoying manner. Hence, the latter operation will only be performed when the vagina is stenosed, or when a very broad perineum interferes with vaginal exposure of a fistula situated immediately above the perineum.

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[1] Kaltenbach, Zschr. f. Gebh. u. Gynaek., IV., Bd. Complicated injury from falling on the prong of a pitchfork. Recto-vaginal fistula, as large as a "mark," in the fornix; septum intact for two fingers' breadths below it; vagina narrowed by cicatrices; perineum destroyed. Division of remaining recto-vaginal septum, lateral paring of the edges of the fistula, triangular perineoplastic operation; recovery.

Operation from the Vagina.—The patient being in dorsal decubitus the vagina is exposed by a bivalve speculum and retractors, and the fistula drawn forward with tenacula or forceps. By projecting the anterior rectal wall by means of a finger in the rectum, the field of operation can be made more accessible and tense. This mode of exposure is better than that of Simon, with the aid of fenestrated specula. Denudation is performed through the entire thickness of the septum in a flat funnel-shaped direction. If the edges of the wound are broad, double sutures are employed, deep ones passing through the entire thickness alternating with superficial ones, which include only the vaginal wall. Great care must be taken that, in tying the threads, the rectal mucous membrane does not protrude between the edges of the wound.

The direction of the line of union depends partly on the original form of the fistula, partly on the mobility of the edges of the wound. In small fistulæ longitudinal union is more convenient, in large semilunar openings transverse union is forced upon us on account of the greater mobility of the recto-vaginal septum from above downwards. The edges of the fistula itself are united in almost all cases. But in a case in which the opening was very large, the uterus prolapsed and retroflexed in such a manner that the os projected into the rectum, Simon united the anterior lip of the cervix to the lower border of the fistula. The menses were subsequently discharged through the rectum. In very large openings with unfavorable edges transplantation of flaps from the vagina and external integument has been adopted.

The operation from the rectum may be performed in the lateral, breech-dorsal or knee-elbow position. The posterior rectal wall is drawn back by a gutter-shaped speculum, and the anus stretched laterally by means of retractors. It may be necessary to cut the sphincter ani if this contracts forcibly. In the breech-dorsal position the anterior rectal wall forms an oblique surface which runs backwards and downwards, and from which the fistular region may be drawn forward still further with tenacula. Denudation and suture must always be supervised from the vagina. Simon enters the needle on the vaginal side ½ cm. from the edge of the wound, while the entering and emerging points in the rectum are close to the edge of the fistula. In this way he endeavored to include a considerable mass of tissue and prevent the inversion of the flabby rectal mucosa between the edges of the wound.

In the operation from the perineum the latter is first divided with a bistoury, by a single incision. The previously inaccessible lateral edges of the fistula are now easily reached, accurately denuded, and widened as much as is necessary. If the width of the perineum was normal, the triangular, accurately fitting wound surfaces are united by sutures on the side of the vagina, rectum and intestines. But if very little of the perineum was left or the rectum itself had been ruptured, the division of the bridge of tissue below the fistula is only a preliminary to bilateral triangular paring, such as is performed for triangular union of old ruptures of the perineum.

The results of the operation, on the whole, are very certain, if sufficiently broad and smooth pared surfaces are produced, and the protrusion of the rectal mucosa between the edges of the wound is prevented.

The danger to life is even less than in operations for urinary fistula, inasmuch as injury to the peritoneum or larger vessels can hardly occur.

The after-treatment is similar to that of other plastic operations in the vagina. The regulation of defæcation is a matter of dispute. Some secure constipation for ten to twelve days by opiates and scanty diet, and hope that at the end of that time the cicatrix will be so firm as to be able to resist the masses of fæces. But in constipation of such long standing, the fæces form hard balls, which seriously endanger the recent cicatrix, and convert the first evacuation, which is often preceded for days by annoying tenesmus, into a veritable torture to the patient. Other surgeons secure soft evacuations from the start by the administration of laxatives, such as castor oil, calomel and jalap, etc. This plan produces no injury in a mechanical way, but the fluid fæces are apt to enter small openings in the line of union and produce infection. Furthermore, the repeated evacuations cause traction on the wound by the frequent expansion and contraction of the longitudinal and circular muscular fibres of the rectum.

We now adopt the following plan in all operative procedures on the recto-vaginal septum. A copious evacuation from the bowels is secured before the operation, and the patient is kept on milk diet and soups for the first three days. On the evening of the fourth day, 0.1 to 0.15 calomel is given, and the next morning, a glass of bitter water. If this is followed by frequent desire to defæcate, the bowels are quieted with opium after the second evacuation. On the following days the bowels are opened every thirty-six to forty-eight hours by mild laxatives. The patients feel much better and recover more rapidly than under the constipation plan. Nor have we observed that the union of the wound is endangered in this way.

CHAPTER VII.

OPERATIONS FOR THE CURE OF PROLAPSE OF THE VAGINA AND UTERUS, AND FOR THE RESTORATION OF THE VAGINAL SPHINCTER APPARATUS.

GENERAL REMARKS.—HISTORY.—LITERATURE.

VARIOUS plans have been pursued for the relief of prolapse. The vulva, vagina and uterus are the points of attack. Even the bladder has been used as the object of operation in urethrocele and cystocele.[1]

Excision of the portio vaginalis, or, at the same time, of a part of the supra-vaginal portion of the cervix, is performed not alone in prolapse, but also in other anomalies. In prolapse it constitutes only an auxiliary operation. In the main there have been two series of operative methods. In one the sole starting-point was the vulva, in the other the higher or lower portions of the vagina. Fricke's pioneer episiorrhaphy consisted of denudation of both labia majora and union by sutures. From a purely anatomical standpoint Fricke's method increases the wedge-shaped mass of tissue between the rectum and genitalia, but only in its lowest part. The results of the operation were rarely satisfactory, because the vagina and uterus broke through the opposing barrier. Hence, the idea was conceived of extending the denudation higher into the vagina, especially to the parts immediately adjacent to the posterior commissure.

Mende proposed denudation in the region of the hymen, Malgaigne deeper in the introitus. Various modifications were adopted (Fig. 205 illustrates Baker-Brown's plan), but all may be regarded as improved episiorrhaphies.

In contradistinction to these methods is that in which the vagina is the sole point of the attack. Some of its originators believed that the stenosis of the vagina *per se* would cure the prolapse. Others thought that, in addition to this stenosis, a firmer adhesion of the vagina to adjacent connections must also be secured. Various caustics were, therefore, applied to the vagina. Jobert cauterized the anterior vaginal wall in cystocele, and after exfoliation of the eschar, united the raw surfaces with sutures. Desgranges cauterized folds of the vagina with a hollow forceps, which contained chloride of zinc. Or he grasped folds of the mucous membrane with numerous serres-fines, and allowed then to remain until they dropped off, in order to produce mortification and cicatricial retraction.

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[1] Bozeman : Urethrocele in the Female. Med. Rec., 1871, 120

More numerous adherents were secured by the methods in which larger or smaller flaps were cut from the vaginal walls and the raw surfaces united with sutures. Sims and Emmet have recently described special methods of denudation and suture of the anterior vaginal wall, and have recommended them as very important operations, which in themselves will not infrequently relieve prolapse of the uterus.

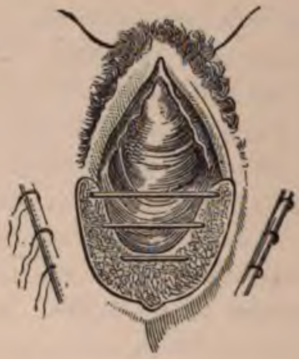

FIG. 205.

Attention should also be called to the methods adopted to secure firmer connection of the vagina with surrounding structures. Bellini used semilunar sutures, which were passed beneath the mucosa and tied tightly. He intended to produce adhesions to adjacent parts, in addition to narrowing of the vagina. Chipendale recommended, with the same object in view, that the mucous membrane be inoculated with the virus of gonorrhœa.

Some of the operations referred to proved entirely useless. Others were successful in certain cases, particularly the improved episiorrhaphy, and occasionally elytrorrhaphy,[1] when large flaps were excised from the vaginal walls

But, as a general thing, the results of these various operations were not encouraging, and they did not find general acceptance

Recently, however, the operative treatment of prolapse has entered a new stage, and is gradually displacing the use of supporting instruments. This is chiefly owing to our better knowledge of the anatomical peculiarities of the morbid conditions included under the term prolapsus uteri et vaginæ. These advances are due to the investigations of Huguier, Freund, Martin, Hueffell, Breisky, Savage, etc

Simon furnished the impetus for better operative treatment of prolapse by combining posterior elytrorrhaphy with episiorrhaphy. He carried the denudation, which had been confined to the introitus and its immediate vicinity, higher into the vagina than all previous operators.

The success attendant on this operation (kolpoperineorrhaphy) soon showed that it must, at least, constitute the principal mode of treatment of prolapse. Other operations can only be regarded as auxiliary

Spiegelberg has combined kolpoperineorrhaphy with union of both vaginal walls. He united the lower part of the anterior to the upper part of the posterior vaginal wall, in order to secure better support for the cystocele.

The Genesis and Anatomy of Prolapse.

The supports of the sexual canal are of a double character. They consist of the peritoneum with its reduplications and the enclosed muscles and connective-tissue fibres, and also the floor of the pelvis with its vaginal sphincter apparatus.

The sacro-uterine ligaments have been regarded hitherto (but much too exclusively) as the peritoneal support of the uterus. There is no doubt that support is also received from the other reduplications, the broad and round ligaments, even the vesico-uterine ligaments, which are efficient on account of their connection with the median and lateral vesical ligaments. Even the peritoneum itself will afford a certain support by means of its adhesions to the surrounding wall, and which, though loose, are very extensive. The mistake of regarding a certain ligament as the sole support of the sexual canal has resulted from the exclusive consideration of *post-mortem* examinations. Many anatomists have regarded even the sacro-uterine ligaments as entirely insignificant, although any rectal exploration with the finger in a healthy woman will convince us of the tension of both ligaments.

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[1] We would recommend that the old term elytrorrhaphy be retained for the operation when confined to the vagina. The term kolpoperineorrhaphy is applicable when the operation involves the posterior vaginal wall at the same time with the introitus.

In investigating the genesis of displacements of the sexual organs, we must take into consideration not alone the peritoneal ligaments and the floor of the pelvis, but also the entire peritoneum and the abdominal walls. Marked relaxation of these walls or the peritoneum, displacements of the kidney, liver, spleen, meteorism, dilatation of the stomach, are very often associated with retroversion and flexion of the uterus.

The mechanism at the floor of the pelvis is very complicated. The pelvic fascia and levator ani form a sort of diaphragm through which the viscera pass. The levator supports the vagina by drawing the rectum towards the anterior wall of the pelvis. Certain bundles of the muscle are also connected with the vagina, so that they exercise a direct action upon it. But the relations of the pelvic fascia to the vagina are much more important. The statements vary with regard to the position in which the fascia comes in contact with the vagina. According to some this is at the boundary between the upper and middle thirds, according to others at the middle of the organ.

The upper part of the vagina is supported very loosely, and is therefore movable and yielding. The lower portion is firmly fixed and less movable, and the elastic turgescent walls are firmly applied to one another. This condition extends about 3 to 4 cm. from the introitus, anteriorly to the region of the neck of the bladder. Corresponding to the internal orifice of the urethra is a transverse, well-marked furrow, which separates the urethral portion of the vagina from the vesico-vaginal septum proper, and which is fixed with special firmness. This is owing to the insertion of the pubo-vesical ligaments into the neck of the bladder. The firm fixation of the urethral portion of the vagina is easily recognized when a woman, whose posterior vaginal wall is pushed downwards, takes deep respirations. The relatively slight movement of this part compared with the vesico-vaginal septum is evident at once. Laterally the vagina is very firmly adherent to the descending ramus of the pubes. If the finger is introduced into the vagina and palpates the lateral and posterior parts, we will notice two bands which, starting on both sides from the pubis, run along the lateral walls obliquely towards the posterior vaginal wall, and unite in its median line about 3 to 4 cm. from the introitus. This corresponds to the free edge of the pelvic fascia and levator ani, or to the place at which these structures come in contact with the vagina. Between this position and the posterior commissure the vagina is strengthened by the mass of tissue in the lower part of the recto-vaginal septum, the so-called body of the perineum. This, together with the lifting support afforded by the levator ani, causes the anterior convexity of the lower part of the posterior vaginal wall. The vaginal mucosa here is very thick, vascular, turgescent (columna, carina). In addition there are circular muscular fibres and the hymen. Thus the entire lower part (about a third) of the canal forms a sphincter apparatus, which plays a great part in the support of the pelvic viscera.

The development of prolapsus may result from primary insufficiency of the peritoneal supports, or of the floor of the pelvis and the sphincter apparatus of the vagina. But both causes are not infrequently present from the start, or the combination appears during the course of the disease.

I. *Insufficiency of the Peritoneal Supports.*

The immediate result of such insufficiency, especially of relaxation of the sacro-uterine ligaments, is a moderate degree of descensus uteri, which is almost always associated with a straight position, or, at first, a moderate retroversion, of the uterus. On account of the lowered position of the uterus, it will be erected more completely than usual by the fullness of the bladder. During micturition the body and cervix of the uterus move uniformly towards the floor of the pelvis. Tension of the sacro-uterine ligaments, which causes increased anteversion of the uterus during micturition, is wanting. The distension of the rectal ampulla (which presses the cervix uteri forwards) during defæcation, also plays a part in the development of the retroversion. The retractor, which prevents this displacement, does not act.

If the retroversion is not marked, it will greatly facilitate further prolapse. The long axis of the uterus is on a line with that of the vagina, like a wedge with the narrowest part in front, and is apt to advance in the direction of least resistance, *i.e.*, into the lumen of the vagina, whenever the intra-abdominal pressure is increased. It thus reaches the upper part of the vaginal sphincter apparatus, whose function is soon impaired. After the portio vaginalis is situated free within the vulva, the uterus is pushed further forwards with a force which corresponds to the difference between the pressure in the abdomen and that of the atmosphere. The walls of the upper part of the vagina descend with the uterus. The form of the vaginal displacement is that of inversion, a proof that the uterus is the organ which was displaced primarily.

When the cervix is visible in the introitus, the conditions are very favorable for complete development of the prolapse. But a primarily intact sphincter apparatus, especially the body of the perineum, the urethro-vaginal septum and the lateral, inferior portions of the vagina, often resist for a long time the complete inversion of the vagina and hence the further descent of the uterus.

The bladder almost always follows the descending uterus and vagina, and thus enters the prolapse. Its relations to the uterus remain normal. Hence, the peritoneum is found a little above the apex of the prolapse, unless the apex is formed subsequently by a higher part of the cervical canal, as the result of a secondary change (eversion of the lips and the cervical canal.) In some cases, however, the bladder does not follow the descending uterus. It may be kept entirely or almost entirely in position by loose connection with the cervix and vagina, by firm adhesion of its vertex to resisting abdominal walls, and by similar adhesion of its neck to the pelvic fascia. The peritoneum then descends with the body of the uterus, and in fully developed prolapse, must run along the inverted vaginal wall, and also along a portion of the bladder which it does not cover under other conditions.

Posteriorly there is almost always a separation between the vagina and rectum, in the upper part of the recto-vaginal septum. The connection here between the two organs is looser than anteriorly. The peritoneum descends with the cervix and fornix, and, in fully developed prolapse, runs from its apex to its base along the inverted posterior wall of the vagina, lying directly beneath it, then back, and finally passes upward along a portion of the rectum, which it does not cover under other conditions, to the part at which it is firmly applied to the wall of the rectum. The upper part of the rectum is not infrequently drawn down towards the opening of the sac formed by the vagina, in the shape of a loop curved from above and behind forwards and downwards.

In the lower part of the recto-vaginal septum the vaginal and rectal walls are closely adherent or rather firmly united to the wedge-shaped mass of the septum. Here a moderate grade of rectocele is apt to form. But the lowermost part of the septum generally resists the downward movement very vigorously, although occasionally only as a firm band.

Prolapsus, as just described, is rare in its pure form, and is only found, as a rule, in virgins or nulliparæ.

A remarkable variety of prolapse developes in considerable firmness of the uterine ligaments or complete pathological fixation, while the remainder of the peritoneum is stretched and relaxed, and yields to abnormal pressure. So-called vaginal herniæ then develop They are rare because their development presupposes numerous conditions, such as fixation of the uterus, loosening and stretching of the peritoneum, intense and constant elevation of intra-abdominal pressure, such as is observed, for example, in tumors with ascites or ascites from other causes. The vagina must be relaxed and yielding. The anterior rectal wall under these conditions must also be projected like a bag towards the lumen of the gut, and prolapsus recti thus developed. Slighter grades of this condition are not so rare as is generally believed. They are a cause of the anteposition of the uterus (Fig. 206), and undoubtedly result from the constant accumulation of fæces above the third sphincter of the anus. Posterior vaginal hernia may persist as such, but the firm supports of the uterus often yield entirely or to a certain extent, and descent or prolapse of that organ then occurs. More or less marked elongation of the cervix occurs, according to the amount of resistance. It is a noteworthy fact, that the posterior supra-vaginal wall of the cervix, upon which the traction acts directly, is sometimes elongated to a greater degree than the anterior wall. The anterior lip alone may undergo hypertrophy. The bladder either descends with the uterus, or remains in its position (Figs. 207 and 208 after Froriep). Anterior vaginal hernia[1] is extremely rare, and only a single observation, which is unfortunately not quite accurate, has been reported (Fig. 209).

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[1] E. Martin, Monatsschr. f. Geburtsh., Bd. 28, 1866, p. 168. The vesico-vaginal septum is prolapsed in the form of a bag containing a peritoneal pocket, which descends between the uterus and the non-displaced bladder. An interesting feature is the enormous secondary elongation of the cervix with more marked implication of the anterior cervical wall, upon which the traction is directly exercised.

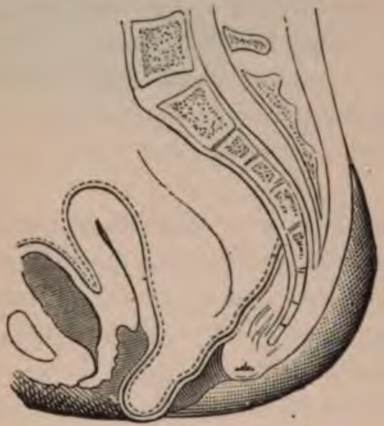

FIG. 206.

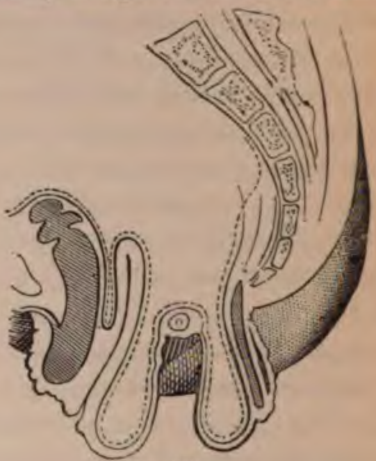

FIG 207.

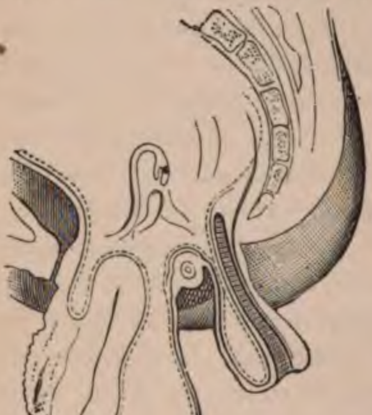

FIG. 208.

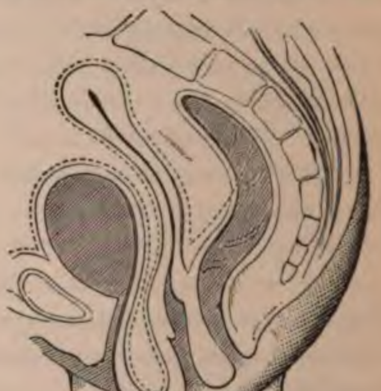

FIG. 209.

Next follows the consideration of primary elongation of the cervix as the cause of prolapse, or, to speak more correctly, as the cause of inversion of the vagina, and the appearance of the portio vaginalis within and in front of the vulvar fissure. The condition is called primary because notable prolapse of the uterus or vagina was not present previously, but rather followed the elongation. Huguier attached an exaggerated importance to this primary elongation, but recently it has been altogether denied. At least it has only been granted with regard to the portio vaginalis, when it is unconnected with prolapse. But primary elongation of the supra-vaginal cervix is denied *in toto*, and this condition is always looked upon as the result of beginning or fully developed prolapse. It is said to develop as the result either of the traction of the prolapsed vagina or of external irritation. Fritsch has recently laid stress on the diminution of pressure, which occurs on the appearance of the cervix near the vulvar fissure, in which the cervix is exposed entirely or in part to the difference between the intra-abdominal and atmospheric pressure. Hypertrophy from the latter cause, therefore, would also be regarded as secondary, and as belonging to a later stage of prolapse.

In our opinion, however, there is nothing improbable *à priori* in the occurrence of primary elongation of the cervix, whether of its vaginal or supra-vaginal portion. Imperfect involution of the uterus in childbed and endometritic processes may act as causes. Likewise, factors which diminish the pressure in the vagina as compared with that in the abdomen, or which induce a position of the cervix in which its long axis corresponds to the long axis of the vagina, so that the portio is situated entirely in the lumen of the vagina and is exposed to slight pressure.

Whether the hypertrophy affects, to a more marked degree, the portio vaginalis or the supra-vaginal portion, or also the body, depends upon accidental circumstances, especially upon the primarily more or less marked pathological changes in one or the other part. Hypertrophy of the vaginal and supra-vaginal portions cannot be distinguished as sharply as is usually done. Huguier showed that the insertion of the vagina into the cervix may become remarkably broad in the condition under consideration. The boundary between both portions of the cervix is thereby entirely extinguished. If there was primarily an hypertrophy of both portions, that of the portio vaginalis may subsequently disappear as the result of special factors which, for example, give rise to marked eversion of both lips.

Appearances which can hardly be interpreted in any other way than by the assumption of a primary elongation, are observed not very rarely. In young persons, virgins or, at least, nullipara, with a firm vagina, and without a trace of prolapse, with a normal or almost normal position of the isthmus (this is the really important point), we have observed inversion of the upper part of the vagina with elongation of the cervix. In a multipara with double uterus, we found one horn (wl been chiefly concerned in pregnancy) much larger tha considerably elongated cervix of the former protruded f and the corresponding portion of the vagina had descen other cervix was approximately normal and the corresp the vagina showed merely traces of the traction whic produced by the displacement of the other half of the case imperfect involution of the entire uterus and also o cervix after the numerous pregnancies, was undoubt factor in the development of the condition in question.

Fully developed and pure forms of Huguier's prol not frequent. They presuppose complete intactness o ments. This is probably not present even from the st quently lost. We then observe a combination of pro trophy of the cervix, disregarding, for the present, tl may also be primary defects in the vaginal sphincte anomalies in the shape and position of the uterus, adv and retroflexion, are also present from the beginnin and exert their influence on the condition of the parts.

If the ligaments have yielded, the cervix enters the vagina, not alone on account of its growth, but also fr organ, and projects more or less into the sphincter app exposed to a marked and constant difference in pressur the tendency to further hyperplastic conditions, and lapse. The latter will develop so much more rapidly, the ligaments yield. The hypertrophy will predomin resistance is still marked. Finally, the uterus may a the vulvar fissure in the most varied degrees of prolapse elongation. Even the entire inverted vagina may li introitus, enclosing merely the elongated cervix or also of the uterus.

The bladder will descend (Fig. 210) on account of its the cervix, but there are exceptions to this rule. The pe at a distance from the apex of the prolapse equal to tl elongated cervix, unless this condition is modified by ev vical canal. Posteriorly the cervix draws the peritoneum of the prolapse, whence, bending back, it passes up into inverted vaginal wall. But there are even exceptions to this relation. e posterior cervical wall may grow out of the peritoneum, and Douglas's remains, in a measure, in its normal position in the pelvis (Fig. 211). he changes which result, at first, in slight descensus uteri, often pass marked retroflexions and retroversions, and these anomalies almost ays oppose marked elongation of the cervix and further descent. As n as there is a moderate degree of descent and retroversion, the conditions favor the increase of the retroversion. If the uterine ligaments are irely relaxed and the vaginal sphincter apparatus, especially the body the perineum, offers no resistance, the prolapse soon increases. But if se ligaments are still resistent, or the perineum opposes further de-

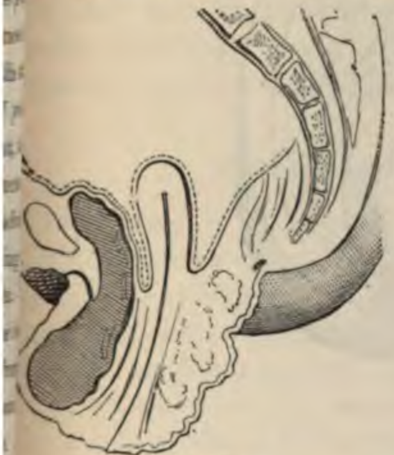

FIG. 210.

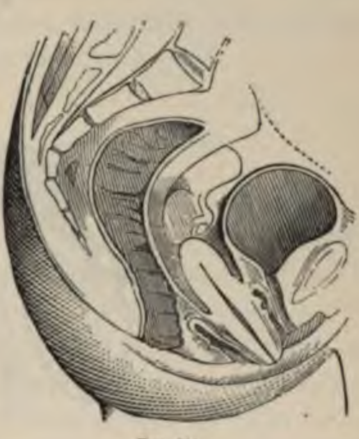

FIG. 211.

ent, increased retroversion or retroflexion is apt to follow. The inseron of the sacro-uterine ligaments into the cervix or the body of the perium forms the hypomochlion. The body of the uterus is pushed towards ouglas's sac by the descending fæces, which are apt to accumulate on count of compression of the rectum by the fundus. If the ampulla of e rectum is evacuated in defæcation, the corpus must fill the empty ace. Thus Douglas's sac is gradually deepened. The bladder, whose pper part chiefly fills because the lower portion is wedged between the mphysis and cervix, passes above the body of the uterus during disten-on, instead of elevating that organ, as in the normal condition.

The degree to which simple version is converted into flexion depends n the degree of firmness of the anterior vaginal wall and of the uterine multipara with double uterus, we found one horn (which had probably been chiefly concerned in pregnancy) much larger than the other. The considerably elongated cervix of the former protruded from the introitus, and the corresponding portion of the vagina had descended with it. The other cervix was approximately normal and the corresponding portion of the vagina showed merely traces of the traction which was necessarily produced by the displacement of the other half of the vagina. In this case imperfect involution of the entire uterus and also of the supra-vaginal cervix after the numerous pregnancies, was undoubtedly an important factor in the development of the condition in question.

Fully developed and pure forms of Huguier's prolapse are, however, not frequent. They presuppose complete intactness of the uterine ligaments. This is probably not present even from the start, or it is subsequently lost. We then observe a combination of prolapse with hypertrophy of the cervix, disregarding, for the present, the fact that there may also be primary defects in the vaginal sphincter. Finally, other anomalies in the shape and position of the uterus, advanced retroversion and retroflexion, are also present from the beginning or develop later, and exert their influence on the condition of the parts.

If the ligaments have yielded, the cervix enters the lower part of the vagina, not alone on account of its growth, but also from descent of the organ, and projects more or less into the sphincter apparatus. It is now exposed to a marked and constant difference in pressure. This increases the tendency to further hyperplastic conditions, and to increased prolapse. The latter will develop so much more rapidly, the more rapidly the ligaments yield. The hypertrophy will predominate so long as the resistance is still marked. Finally, the uterus may appear in front of the vulvar fissure in the most varied degrees of prolapse and hypertrophic elongation. Even the entire inverted vagina may lie in front of the introitus, enclosing merely the elongated cervix or also a part of the body of the uterus.

The bladder will descend (Fig. 210) on account of its connection with the cervix, but there are exceptions to this rule. The peritoneum remains at a distance from the apex of the prolapse equal to the length of the elongated cervix, unless this condition is modified by eversion of the cervical canal. Posteriorly the cervix draws the peritoneum down to the tip of the prolapse, whence, bending back, it passes up into the pelvis along the inverted vaginal wall. But there are even exceptions to this relation. The posterior cervical wall may grow out of the peritoneum, and Douglas's sac remains, in a measure, in its normal position in the pelvis (Fig. 211).

The changes which result, at first, in slight descensus uteri, often pass into marked retroflexions and retroversions, and these anomalies almost always oppose marked elongation of the cervix and further descent. As soon as there is a moderate degree of descent and retroversion, the conditions favor the increase of the retroversion. If the uterine ligaments are entirely relaxed and the vaginal sphincter apparatus, especially the body of the perineum, offers no resistance, the prolapse soon increases. But if these ligaments are still resistent, or the perineum opposes further descent, increased retroversion or retroflexion is apt to follow. The insertion of the sacro-uterine ligaments into the cervix or the body of the perineum forms the hypomochlion. The body of the uterus is pushed towards Douglas's sac by the descending fæces, which are apt to accumulate on account of compression of the rectum by the fundus. If the ampulla of the rectum is evacuated in defæcation, the corpus must fill the empty space. Thus Douglas's sac is gradually deepened. The bladder, whose upper part chiefly fills because the lower portion is wedged between the symphysis and cervix, passes above the body of the uterus during distension, instead of elevating that organ, as in the normal condition.

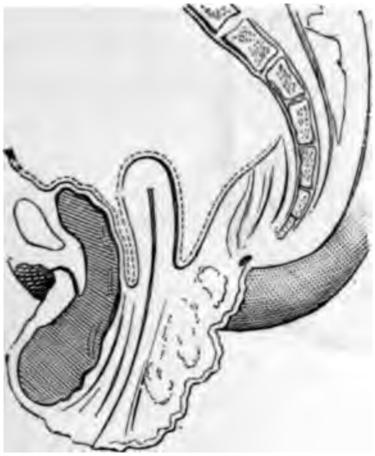

FIG. 210.

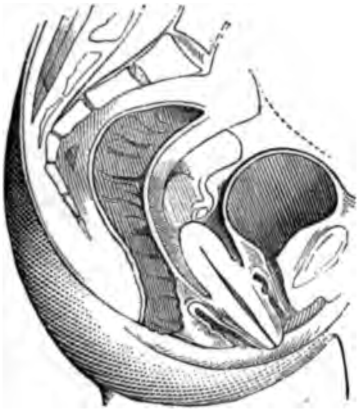

FIG. 211.

The degree to which simple version is converted into flexion depends on the degree of firmness of the anterior vaginal wall and of the uterine tissue at the point of flexion. Descent towards the lumen of the vagina is impossible. The body of the uterus can only be pushed down in a direction which corresponds to the anus. It gradually passes deeper into Douglas's sac, which itself pushes farther between the rectum and the wall of the vagina. In extreme cases the uterus may appear in a prolapse of the anterior rectal wall through the anus, or, if there is an increased yielding character of the posterior vaginal wall, in a prolapse of the latter through the introitus vaginæ. It is only when the entire floor of the pelvis, particularly the body of the perineum, is extremely yielding that prolapse proper of the uterus is still possible in marked retroflexion.

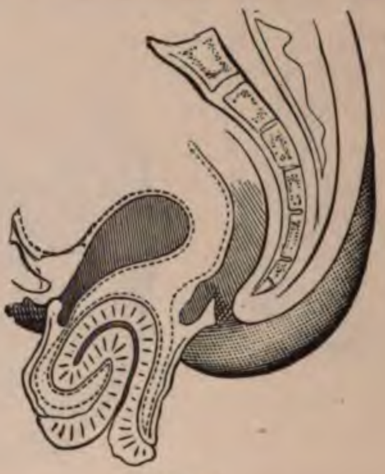

FIG. 212.

As a general thing, the extreme forms last described are not apt to develop. The retroversions and retroflexions, which originally resulted from the prolapse, remain stationary at a certain stage of development. This suffices to prevent further prolapse. As the formation of such a degree of version requires a certain resistance of the sacro-uterine ligaments or the body of the perineum, this explains the relative frequency of retroversions and flexions, and the rarity of prolapse in virgins and nullipara. Moreover, a further factor, *viz.*, the formation of adhesions, may antagonize the development of prolapse in retroversions and flexions.

Not alone are marked versions and flexions an obstacle to the develop-

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[1] From this fact arose the peculiar proposition of Sepffert to cure prolapse by the artificial production of marked retroflexion.

ment of prolapse, but they often offer, to a certain degree, an obstruction to considerable elongation, or, at least, impress peculiar features upon it. In marked retroversions or retroflexions the anterior lip is often pressed forcibly against the tense anterior fornix, or even pressed into it. A hypertrophic condition is then impossible; the opposite is much more likely. This is not true of the posterior lip, which is directed more towards the lumen and undergoes enlargement. The posterior lip is rarely pressed firmly into the vaginal wall, as in extreme retroversion with slight flexion.

Prolapse develops very rarely in marked anteflexion of the uterus. In the case illustrated in Fig. 212, the bladder is nearly in its normal position. The connections between it and the uterus have disappeared. On account of the marked eversion of the lips of the cervix the peritoneum reaches almost to the apex of the prolapse, then bends back and passes along a part of the bladder which it did not cover before.

2. *Insufficiency of the Sphincter Apparatus.*

The supports of the sphincter apparatus are loosened by coitus, but particularly by parturition. Coitus and unnatural gratification of sexual desire cause partial loss of the hymen. The constrictor cunni and the elastic tissue around the introitus are stretched and made flaccid. The effects of parturition are much more pronounced. The hymen is destroyed almost entirely, the constrictor cunni and the elastic tissue are very much stretched and often made permanently flaccid. The stretching and even rupture also extend farther and deeper. The pelvic fascia and levator ani are torn not infrequently, particularly near the bones anteriorly, and in the antero-lateral part of the vagina near the introitus. The muscle may even be torn from its insertion. The cicatrices and losses of substances are easily felt by following with the finger the loop-shaped band, which has been already described (*vide* Schatz, Zerreissungen des muskulœsen Beckenbodens bei der Geburt, Arch. f. Gyn. Bd. XX.). These injuries may occur although the mucosa is untorn. The connections of the urethra and urethro-vaginal septum generally remain intact, and are usually not implicated until a later period by the more fully developed prolapse. The anterior vaginal connections with the pubis also remain intact unless the obstetrician makes deep lateral incisions.

The posterior part, on the other hand, is often very much relaxed and torn. Here we find the various degrees of rupture of the perineum. Almost as important and, at least, even more frequent, are ruptures of the vagina and fossa navicularis, longitudinal ruptures on one or both sides of the columna, and fine horse-shoe ruptures which separate the columna from its base and draw it upward. All these injuries are not infrequently present (often in a severe form) although the posterior commissure is entirely uninjured.

As the immediate result of such injuries the carina loses its point of support. It floats in the air, as it were, and can aid very little or not at all in closure of the vagina. Higher parts of the vagina are exposed constantly to the difference between the atmospheric and pelvic pressure. Closure is incomplete. As soon as the walls of the vaginal ampulla are subjected to strong pressure, they offer no resistance to their downward motion. Instead of the long canal, which constitutes the sphincter apparatus under other conditions, there is merely an opening. Any part of the recto-vaginal septum which still remains resistent, affords an insufficient support for the vesico-vaginal wall. The repeated distension of the bladder acts unfavorably in this direction. Not very infrequently the posterior vaginal wall also descends, and then a sort of closure may result if an anterior and posterior fold come in close contact. In rarer cases the posterior vaginal wall is chiefly or exclusively affected, especially if previous accumulations in the rectal ampulla as the result of constipation have led to a predisposition to rectocele.

The uterus follows the descending vagina, and the cervix approaches the introitus. The bladder, a part of which still remains behind the symphysis, presents an obstacle to the anterior movement of the body of the uterus, and thus arises a lever action on the organ, so that it becomes straight or retroverted. If the sacro-uterine ligaments are resistent, it may become straight without undergoing prolapse, inasmuch as the vesico-vaginal septum, in moving towards the introitus, exercises traction on the vaginal insertion in the same direction. The sacro-uterine ligaments then form the hypomochlion of rotation.

It is only in rare cases of marked resistance of the sacro-uterine ligaments and in pathological fixation, in which the cervix was originally situated high up posteriorly, that we may also find pronounced anteversion or anteflexion. The body of the uterus has then followed the descended bladder and lies above it in the prolapsed anterior vaginal wall

The further progress of the displacement varies, according as the anterior or posterior or both vaginal walls are chiefly implicated. In the majority of cases the anterior vaginal wall and the bladder are most affected. They project more and more into the introitus; inferiorly, the urethra with its internal orifice gradually yields, while superiorly the cellular tissue connections with the cervix are extended. Hence, the peritoneum is often found at an early period nearly above the insertion of the vagina into the uterus (Fig. 203).[1] The posterior vaginal wall is gradually inverted, starting from the uterus. At the same time the upper part is almost always separated from the rectum, so that the peritoneum, which is drawn down with the cervix and fornix, is inserted between the rectum and bladder (Fig. 214).[2] The most protracted resistance is offered by the base of the recto-vaginal septum, so that a vaginal *cul-de-sac* remains for a long time in this locality. If this also disappears, the anterior rectal wall usually passes as a rectocele, though, perhaps, only to a slight extent, into the prolapse. The final stage is characterized by the fact that the anterior vaginal wall, supported by its last remaining connections with the pubis, opposes further prolapse, and then the uterus sinks to a greater degree The previously ridge-shaped projecting vaginal wall now suffers inversion.

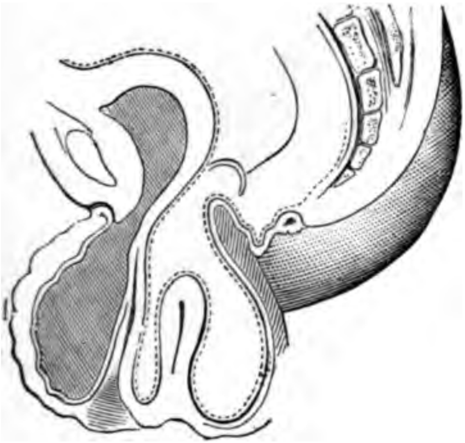

FIG. 213.

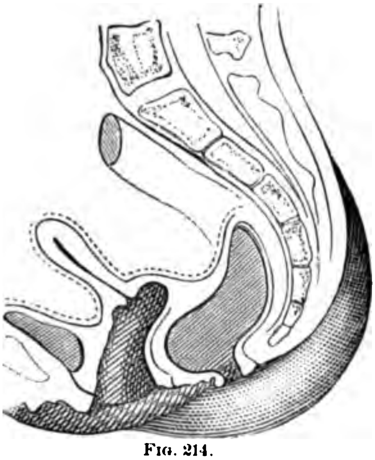

FIG. 214.

If the posterior wall is chiefly affected—this is rare and usually results, in the main, from advanced rectocele—the condition of things is reversed (Fig. 215).[1] In such cases the bladder sometimes remains more or less in its normal position.

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[1] Cystocele in the initial stage, after Froriep's copper plates, 435, fig. 3

[2] Fully developed prolapse with cystocele, after Froriep's copper plates, 416, fig. 4.

In approximately equal prolapse of both vaginal walls, the bladder always and the anterior rectal wall usually (at least its lowest part) enter the prolapse.

If the mechanism described meets with obstacles from the start, or if these appear during the subsequent stages of development of the prolapse, the most varied modifications of the prolapse and combinations with structural changes make their appearance. The chief obstacles are firmness of the peritoneal attachments or notable anomalies of shape and position, such as flexions. Finally, modifications are also owing to the fact that certain parts of the sphincter apparatus and floor of the pelvis retain their resistance to a greater or less degree. Indications of these influences are found in almost every prolapse; in many cases, indeed, these modifications are so pronounced that they constitute the most important element of the entire anomaly.

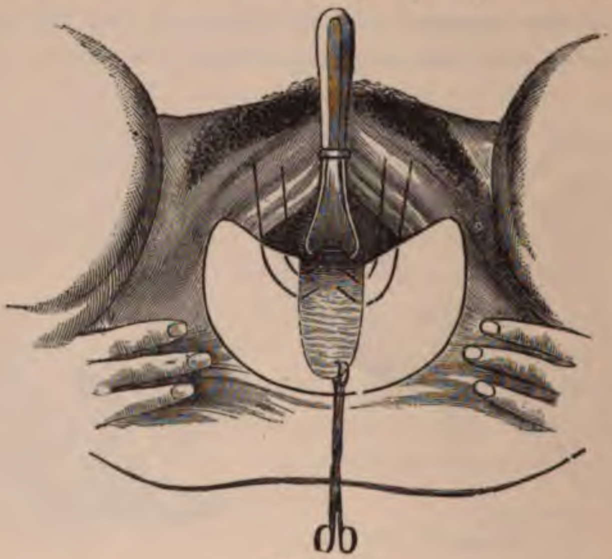
FIG. 215.

If the uterus is fixed by firm sacro-uterine ligaments or by adhesions, and, as generally happens, in a straight position or in moderate retroversion, the prolapsed walls of the vagina exercise traction on the vaginal insertion into the cervix. This traction affects the supravaginal portion of the cervix, inasmuch as the region of the isthmus is almost always the site of counter-pull. The supra-vaginal cervix is elongated, thin and atrophic unless other influences intervene. We notice a roller shape of the cervix, which may even be reduced to the thickness of a lead pencil. Almost complete separation of the body of the uterus from the cervix has also been observed. The traction is aided by the diminished pressure to which the cervix is subjected. As a result of this factor it has a tendency to swell from increased fullness of the vessels. Both factors are therefore opposed to one another in certain respects. The diminished pressure causes hypertrophy, the traction causes atrophy, but associated with elongation. The former acts on the inferior portions of the cervix, the latter on the upper portion.

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[1] Rectocele in the initial stage, after Froriep's copper plates, 435, fig. 4.

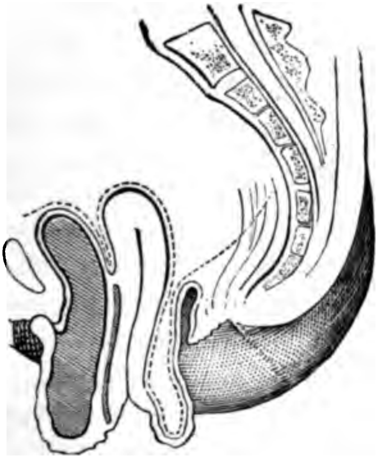

FIG. 216.

For this reason alone the final results must be very different, inasmuch as these two factors act in the most varied combinations. The effects also vary, according as the prolapse of the vaginal walls is approximately equal, or one of them is affected more markedly than the other. If both vaginal walls are affected, the traction and the change of pressure act with approximate uniformity upon both walls of the cervix. This will result in a uniform elongation or hypertrophy (Fig. 216).[1] If the anterior wall of the vagina is more markedly affected, as usually happens, the traction acts first on the anterior cervical wall and elongates it. The posterior wall would also be entirely exposed to the traction, were it not for the fact that fissures in the commissures, or rather their sequelæ, interfere with the action of the traction on the supra-vaginal portion of the posterior cervical wall. These fissures are often associated with strong cicatricial bands, and antagonize the effect of the traction on the posterior wall of the cervix. A similar effect is also exercised by the lower portion of the recto-vaginal septum, after the inversion by the elongated cervix has reached that part. Under such circumstances the posterior lip is almost always in the lumen of the vagina, is exposed to the diminished pressure and becomes swollen. We then find a peculiar condition in which the anterior supra-vaginal portion is markedly elongated, without swelling and even with diminution in the size of the corresponding lip, as the result of eversion or marked proliferation of the vaginal insertion. Posteriorly, on the other hand, the supra-vaginal portion is elongated very slightly or not at all, while the lip is long.

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[1] After Francque.

If the posterior vaginal wall is chiefly involved the conditions are reversed, but this is much rarer than the preceding variety.

Even if the peritoneal attachments and pathological adhesions were originally very firm they will finally yield to a certain extent and become elongated, so that it is in very rare cases that the isthmus uteri is not found below its normal position.

Posteriorly the peritoneum is always found at the apex of the prolapse. Anteriorly the distance between the two is equal to the length of the elongated cervix. But this relation may be changed by subsequent eversion.

In insufficiency of the sphincter apparatus retroflexions and anteflexions also offer an obstacle to the development of complete prolapse, but only when certain parts of this apparatus and of the floor of the pelvis are still capable of resistance. In retroflexion we again find the peculiar form in which the uterus rides upon a still intact lower portion of the recto-vaginal septum. The cervix is situated in the lumen of the vagina, and is elongated and hypertrophied by the traction of the prolapsed vaginal wall and by the diminution of pressure. An anteverted body of the uterus may be situated upon that portion of the bladder which is contained in a large prolapse of the anterior vaginal wall. A rarer condition is that in which the retroflexed body of the uterus, after pushing Douglas's sac forcibly downwards, is situated upon a colossal rectocele, and, with the latter, forms the principal part of the prolapse. At its posterior part, below the inverted vaginal wall, we find first the rectocele, then the peritoneal fold, and finally the uterus. Anteriorly only a small portion of the bladder enters the prolapse. This is true, at least, of the cases of this kind which have been accurately described.

In the preceding remarks the genesis of cases of prolapse has been sharply distinguished according to their etiology. The parts played by primary insufficiency of the peritoneal attachments or by primary insufficiency of the sphincter apparatus have been kept separate. The relations of these factors to other anomalies of shape and position have also been considered.

As a matter of fact both main causes are often combined. Insufficiency of the sphincter apparatus, however, plays the greater part in prolapse, and the majority of these anomalies in their fully developed form owe their origin to this cause. Their form is modified to a marked extent by the greater or less resistance of the peritoneal attachments. Primary insufficiency of the peritoneal attachments, on the other hand, gives rise to retroversion and retroflexion much more frequently than to prolapse. The latter will hardly be produced by weakness of the ligaments without coincident changes in the sphincter apparatus and floor of the pelvis. The stage in which the uterus is straight or moderately retroverted and which favors prolapse, does not long remain stationary. These anomalies soon become more pronounced and then antagonize the development of prolapsus. It is unnecessary to enter further into the modifications which the mechanism undergoes when both main causes act in combination.

Diagnosis of the Anatomical Conditions in Prolapsus.

Information concerning the condition of the bladder is furnished by the catheter, concerning the rectum by the exploring finger. Hypertrophy of the cervix is easily detected, but it is sometimes difficult to distinguish hypertrophy of the supra-vaginal portion from that of the portio vaginalis. The inverted portion of the vagina is often so closely applied to the cervix that the supra-vaginal portion may be mistaken for the portio vaginalis. The following are the differential features: In some cases a shallow groove is found below the vaginal insertion, or there is a distinct difference in color between the vagina and portio vaginalis. The latter is often distinctly smooth, the vaginal wall is wrinkled after it is replaced. The parts should always be restored to their normal position. The everted lips then become more prominent. If the non-reduced tumor is grasped between the fingers and is allowed to glide to and fro between them, the movement of the cervix in its envelope is felt at the supra-vaginal portion. This is not felt at the portio vaginalis. A fold of the inverted vagina is easily picked up with the fingers or forceps and can be moved to and fro.

The distinction must be made in amputation of the cervix, though it is not so important as was formerly believed. The greater elongation of the vaginal insertion at the cervix diminishes the danger of injury to the peritoneum. A conical excision also diminishes this danger, and, finally, an incision into the peritoneum is not a very serious matter.

From the previous description of the genesis of prolapse we can easily determine where the peritoneum is to be encountered during operative procedures. If there is a cystocele without elongation of the cervix, the peritoneum is almost always found deep near the vaginal insertion. If there is considerable elongation we may be certain that the peritoneum will be found anteriorly at a certain distance from the apex of the prolapse, unless there is marked eversion. If there is a considerable rectocele on the posterior side of the prolapse, we may be sure, at least, that the peritoneum will not be found at this point. In large, ridge-shaped projections of the posterior vaginal wall without rectocele, we may sometimes find merely pronounced, elephantiatic hypertrophy of the mucosa and submucosa. In such an event it is often difficult to arrive at a conclusion. If there is a protrusion of Douglas's sac, the layers of the projection may be separated from one another, but in pure hypertrophy the finger gives the feel of a uniform, compact mass of tissue. Fluid effusions or the presence of loops of intestines rarely aid the diagnosis. But the method (to be described later) of removing such projecting ridges entails very little danger of opening the peritoneum.

We must again call attention to a point of importance in the ordinary operations. In a small part of the vesico-uterine fossa, at its lowest point, the peritoneum does not possess the firm connections which it exhibits over other parts of the bladder and uterus. Posteriorly the connection of the peritoneum with the cervix and fornix likewise is not very firm, on account of the presence of a considerable amount of sub-peritoneal tissue. Furthermore, if the peritoneum is found, in prolapsus, in situations in which otherwise it does not exist, such as the anterior wall of the cervix, the lower part of the vagina and even near the introitus, it is merely in apposition with these structures, but is not united to them. The danger of injury to the peritoneum, therefore, is not so great as we might suppose *à priori*. We have injured the peritoneum very rarely in our numerous amputations of the cervix, fistula operations and formation of flaps in the vagina.

But we remember a number of operations in which a suspicious opening suddenly came into view and a loose gelatinous tissue, occasionally even a sort of bladder, appeared in the opening. We distinctly remember an amputation of the cervix performed by Simon with the *écraseur*. After separation of the cervix an opening of the kind referred to appeared in the anterior fornix. We introduced the finger and entered a wide-meshed tissue but no free cavity. The peritoneum was not injured. We have since met with similar conditions (but only on the posterior vaginal wall) and convinced ourselves with the sound that the peritoneum had not been opened. But we do not, on this account, recommend careless operation, inasmuch as we regard the exposure of the sub-peritoneal tissue as not devoid of danger, and recommend the immediate closure of such openings with sutures. On the other hand, we would also warn against laying too much stress on the dangers arising from the vicinity of the peritoneum in operations for prolapse or other affections. In kolpoperineorrhaphy, for example, high denudation has been discredited on this account. Denudation of half of the vagina is attended with approximately the same chances of injury to the peritoneum as is the high operation. The protection in both is the loose connection of the peritoneum with the denuded tissues.

CONDITIONS AND INDICATIONS.—PROGNOSIS.—PERIOD OF OPERATION.

General Remarks on the Methods of Operation.

The following are the conditions under which operative treatment is admissible in prolapses of the vagina and uterus:

The prolapse must be of such a nature that its relief by milder means seems impossible. If the displacement has not lasted long and is not very pronounced, the usual methods of treatment should be adopted, but they rarely promise permanent results. The cause of the disease may not be of such a character that it renders permanent success of the operation doubtful by narrowing the abdominal and pelvic cavities. These causes, such as tumors, may sometimes be removed. But certain factors, such as deformities of the bones, can not be relieved. The latter contra-indication, however, only holds good in very considerable shortening of the abdominal cavity as the result of deformity. We have produced permanent recovery of a severe prolapse in a case of marked dorsal kyphosis, although the patient subsequently performed, for years, the fatiguing duties of a nurse in our clinic.

Another condition consists of the absence of general weakness. This condition may often be secured by suitable treatment. Advanced age makes the operation inadvisable, although more depends upon the corporeal condition than upon the number of years. We have operated successfully in individuals past the age of sixty years.

Certain complicating general and local diseases may interfere with the operation or at least render it inadvisable, particularly syphilis prior to thorough treatment.

We consider the operation indicated in all cases in which the conditions mentioned are present or may be secured. The dangers are slight, provided infection is avoided. Among about 400 cases of prolapse operations we have had two deaths, both of which occurred among the first hundred. The operation seems more justifiable than many others which, although attended with the same danger, are employed generally for the relief of lesser evils. In many cases reduction by means of pessaries or bandages is impossible or at least very difficult, and, in addition, we not infrequently find anatomical conditions, such as considerable elongation of the cervix, which *per se* require operative interference. We would not reserve the operation for the most severe cases. As a general thing, it is true, the milder grades of prolapse may be retained by the aid of pessaries, but these hardly ever produce permanent recovery. On the contrary, the disease is aggravated not infrequently, so that larger pessaries must be introduced. The less severe grades of the disease can be surely cured by a slight operation and with less danger.

The narrow vagina is often distended to a remarkable extent during a subsequent parturition. If we employ all the precautions for supporting the perineum, and, if necessary, make median incisions, which may again be united with sutures, there is no danger of seeing the results of our labors jeopardized.

Kolpoperineorrhaphy is also indicated in a patulous condition of the introitus, if catarrhs of the genital tract result from chemical and mechanical injuries to the exposed parts or from the entrance of infectious germs; also, when symptoms of nervous irritation are produced by the patulous condition. The most annoying catarrhs of this character, and which could be relieved permanently by vaginal closure alone, have been observed by us particularly at or after the menopause. We believe that a prophylactic operation is proper in such individuals, if the introitus gapes widely.

Exposure of the lower part of the vagina sometimes gives rise to very severe nervous irritation, terminating finally in anorexia, insomnia, general nervous depression, and which are very rapidly cured by operation.

In only one case have we found an indication for kolpoperineorrhaphy in a very extensive cicatrix at the introitus. Extremely disagreeable sensations were felt, but it was impossible to say whether they were the effects of the cicatrix or of the coincident gaping of the introitus.

The operation may be performed at almost any time, except during menstruation. If the question of operation arises soon after parturition, it is advisable to wait six to eight weeks, when the vascular dilatation, hyperæmia and swelling of the organs have, in great part, disappeared.

The operations performed in the treatment of prolapse are excision of the cervix, suture of the vagina (elytrorrhaphy) and strengthening of the recto-vaginal septum (kolpoperineorrhaphy).

The cure of prolapse can only be effected by the restoration of the peritoneal supports or of a properly acting sphincter apparatus. The former cannot be secured by operation, except by the production of pathological adhesions with all their injurious consequences. Such a plan would suffice in those cases alone in which the prolapse results primarily from the yielding of the peritoneal supports, and which are not associated with relaxation of the floor of the pelvis.

In some of the earlier methods,—the use of strong caustics, constricting sutures, etc.,—adhesions may have developed not infrequently without the will of the operator. In the newer methods this undoubtedly happens very rarely. Apart from the fact that fever and peritonitic symptoms are not observed after the majority of operations, normal or even excessive mobility of the uterus can almost always be demonstrated at a subsequent period.

Whether greater attention should not be paid, especially from a prophylactic point of view, to the retention and restoration of the normal tonus of the peritoneum and its folds, is a different matter. Much can be effected in this direction, particularly after parturition. The relief of flaccidity of the abdominal walls by gymnastics, electricity, suitable positions, regulation of the bowels, the urinary excretion and nutrition, action upon the sacro-uterine ligaments by the use of cold, massage, etc., are indicated.

The chief operation for the relief of prolapse consists, therefore, in the restoration of the vaginal sphincter apparatus by kolpoperineorrhaphy. Excision of the cervix and the various forms of simple elytrorrhaphy must also be taken into consideration as auxiliary measures.

EXCISION OR AMPUTATION OF THE CERVIX.

The description of the technique of this operation is found in another place. We will here consider its indications in prolapse, and certain modifications according to the situation of the hypertrophy of the cervix.

The removal of the portio vaginalis is indicated whenever it is considerably elongated and thickened, provided that resolution of the tissue changes may not be expected as the result of the reduction brought about by other operations. Soft enlargements often subside as soon as the patients lie quietly for a time. In isolated hypertrophy of the portio vaginalis, excision at the level of the vaginal insertion will suffice.

Hypertrophies of the supra-vaginal cervix, especially recent forms and those produced mainly by the traction of the prolapsed vagina, not infrequently disappear in a quiet position with the buttocks elevated, from the administration of laxatives, and the application of tincture of iodine. But when they have lasted a long time, and the cervix is not alone elongated but also thickened and hard, and the submucous tissue of the vagina is hyperplastic, then excision is indicated. The results of kolpoperineorrhaphy may be endangered by the hypertrophic cervix, especially when the latter is replaced in the pelvis with difficulty but is not notably curved or flexed. This happens when the uterus is fixed by rigid, unyielding ligaments or new-formed bands. In moderate elongations, in which the uterus is readily replaced, excision of the cervix is unnecessary.

In elongation of the supra-vaginal cervix quite a large piece may be excised without running the risk of cutting the peritoneum. This is guarded against by the usually very broad insertion of the fornix. A sufficiently large mass of tissue may be removed by an incision which gives a conical shape to its upper part. Simon's modification, in which a sort of notch is formed in the stump, often suffices. Complete division of the anterior fornix of the vagina, as performed by Huguier and later by Schroeder, is rarely necessary.

ELYTRORRHAPHY.

This operation consists of the excision of larger or smaller, variously shaped flaps, with their long diameter corresponding to that of the vagina, from the vaginal mucosa and the union of the raw surfaces by sutures.

(A.) *Anterior Elytrorrhaphy.*

This consists of the excision of flaps from the vesico-vaginal wall, but not from the urethro-vaginal wall. It is indicated when the anterior vaginal wall is prolapsed as a very large ridge or bag. The ridge may contain chiefly the bladder or it may be composed of markedly hypertrophic connective tissue, and the uterus may be more or less prolapsed. In the latter event the uterus is replaced and the condition of the anterior vaginal wall then determined.

We must endeavor to give this wall a certain degree of firmness, else the flabby vesico-vaginal septum, even after the restoration of a good sphincter apparatus, is apt to reenter, as the result of vigorous action of the abdominal muscles or notable distension of the bladder. If the vesico-vaginal septum is still quite firm, anterior elytrorrhaphy is unnecessary. There are intermediate degrees of relaxation in which the operation is not absolutely necessary, but is often advisable as an auxiliary operation. The slight painfulness of the operation, which usually renders an anæsthetic unnecessary, and the absence of danger makes it appear advisable, under such circumstances, that the operation should precede kolpoperineorrhaphy. Formerly both operations were performed at different times, but this necessitated a great loss of time.

Hitherto there has been no distinct method of operation which has secured general acceptance. Formerly the denudation was generally made elliptical. Sims gave it the shape of a horse-shoe, whose commissure lay in the vicinity of the urethral meatus. Both sides were united with sutures over the non-denuded median portion of the vagina. As the portio vaginalis was situated in the blind sac which was thus formed, Sims added short transverse denudations (Fig. 217). Emmet gave the wound the shape of a trowel, with the broad end towards the portio vaginalis (Fig. 218). He has recently recommended a complicated procedure: formation of three small raw surfaces, one in front of the portio vaginalis, one each on the right and left sides in the lateral part of the fornix. The two lateral surfaces are connected with the median one by a suture. Sims's method offers no special advantages. In Emmet's first method, the two halves often do not unite uniformly at the broad end. The second method will hardly find many imitators. Both authors believed that this operation alone would cure even considerable vaginal and uterine prolapse, but this is impossible.

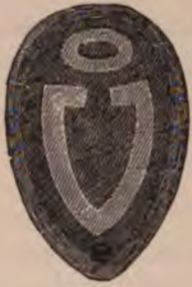

FIG. 217.

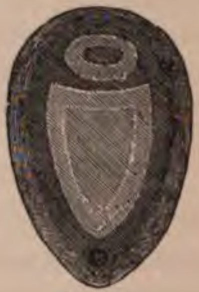

FIG. 218.

Broad denudation in the upper part of the vagina possesses certain advantages. The tension here is less, union by first intention is more apt to occur, and on the sides are found larger masses of tissue which may be united with sutures. If these advantages are to be secured, and, at the same time, the wound is to have a favorable shape for union, it must be made elliptical with the upper angle as oblique as possible (Fig. 219). But inasmuch as anterior elytrorrhaphy is only an auxiliary operation, we merely excise a simple uniform longitudinal fold, and attach no importance to the special shape of the denudation. In this way the operation may be performed very rapidly and almost without hemorrhage. This may be followed at once by kolpoperineorrhaphy.

The patient should be placed in the lithotomy or breech-dorsal position. The operation is slightly painful, and the administration of an anæsthetic is necessary only in very anxious and sensitive individuals.

Four assistants are needed, two for fixation of the limbs and assistance in exposing the field of operation, etc., one for handing instruments and preparing the sutures, and one for handling the sponges and irrigating.

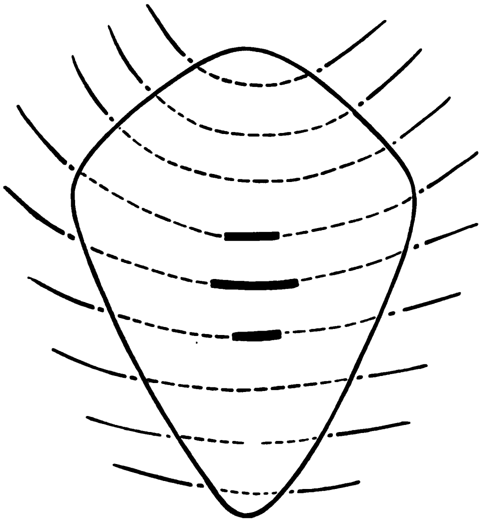

FIG. 219.

The instrumentarium consists of small, broad-bladed bistouries, a pair of scissors curved on the flat with not too thick blades, a few volsellæ, artery forceps, needles, needle-holders, straight scissors, small sponges and sponge-holders, irrigator, wire or silk, catheter. In the method often adopted by us of late, we also require strong forceps for clamping a raised fold, or a special clamp and blunt pointed bistouries. A longitudinal fold in the anterior vaginal wall is first formed by means of two to three volsellæ. The upper one is applied about 1 cm. from the anterior lip, the lower one about 3 cm. from the urethral meatus. By pulling on these instruments the fold is raised and a clamp is applied in a longitudinal direction. For this purpose we may use Krassowski's forceps, a large Hegar hæmostatic forceps or Cheron's apparatus (Fig. 220). The instrument must be applied nearer to the ridge than to the base of the fold. The compression may be vigorous. The sutures are now inserted under the instruments which have been applied, and at a little distance from them, at intervals of 1 cm. from one another. They are then handed to an assistant. The fold is then cut away with a bistoury between the row of sutures and the clamp apparatus. The sutures are then tied, and accurate closure of the wound completed by superficial sutures. After coaptation the wound is pressed together from the sides in order to ascertain whether any blood has been extravasated. If this has occurred in any part and blood escapes between the sutures, the part is enclosed in a deep ligature.

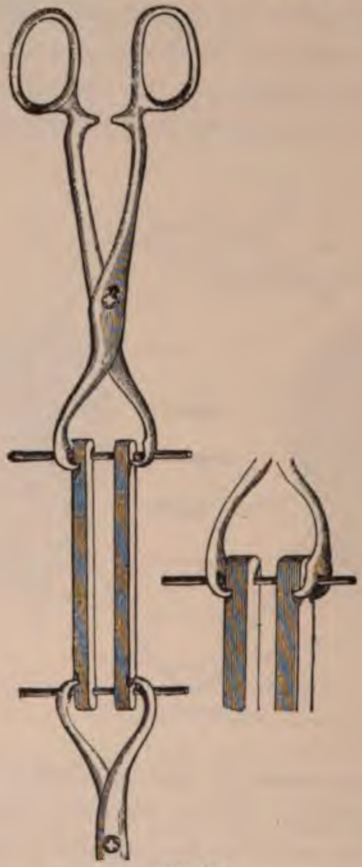

FIG. 220.

There is one danger in this operation. The wall of the bladder may be included in the fold and excised. But this risk is not as great as it appears, and we have never injured the bladder in this way in a large series of operations. Before applying the clamp the thickness of the vesico-vaginal septum is tested, if necessary, with the aid of the catheter. As a general thing we can feel, with the fingers, the vaginal wall, and beneath it the wall of the bladder. If the question is still doubtful, the catheter may be introduced while the needle passed through the fold is still in position, in order to feel whether metal comes in contact with metal. The excised portion is usually quite thick, and has approximately a wedge shape. Union by first intention is more apt to occur than after the formation of flaps, partly because the tension is never excessive, partly on account of the wedge shape.

If the vaginal wall is very thin the bladder is more apt to be injured, and it is better to adopt the old method of operation.

This consists in the dissection of a flap which has a regular elliptical shape or is broader towards the portio vaginalis. The width of the flap depends upon our estimate as to how much can be united without excessive tension. Sims advises that, after reduction of the prolapse, a uterine sound be pressed firmly into the median line of the anterior vaginal wall. We then note the place at which the longitudinal folds on each side of the sound come in contact with each other above the sound. This is the place at which they should be united after denudation. The tension is tested by introducing two tenacula on the sides and bringing the hooked portions together in the median line. The thickness of the flap depends on the thickness of the anterior vaginal wall.

The exposure and tension of the field of operation are secured in the following way: A volsella is applied about 1 cm. from the anterior lip, and this part then drawn into or near the introitus, and then forcibly towards the posterior commissure. A second forceps is applied 2 to 3 cm. from the external orifice of the urethra, and this part then fixed at the lower border of the ramus of the pubis. Two forceps are then applied on the right and left sides at the points which correspond to the greatest transverse diameter of the future raw surface. The anterior vaginal wall is thus stretched vertically before the operator.

The external incision is first made, the lower lip of the flap is then grasped with forceps, and separated with a bistoury from its base. The ability to use the knife in either hand is very useful in this procedure. If the tension proves insufficient on one side or the other, another forceps or tenacula may be applied. The tip of the knife is always directed towards the flap. It is best to separate the flap first around the entire circumference for a little distance, and then to separate it more extensively from the lower angle. The separated part is then grasped between the thumb and index finger of the left hand and separation completed

Some operators prefer to use the scissors. The field of operation is then pared in small pieces by short cuts with the scissors. Bischoff scalps the flap, which has been separated a little at its circumference by means of a bistoury. He grasps the separated part between the fingers, and tears the remainder from its base. This may do very well for a short distance, but then it tears too deeply or too superficially. At all events we must always use the knife, to a certain extent, if we wish to obtain a flap of uniform thickness.

Whether one plan or another is adopted, the inequalities of the raw surface must be smoothed with the scissors. This is often done with advantage, even while the sutures are being tied.

The sutures next to the portio vaginalis are tied first.

Considerable hemorrhage during denudation is checked by the temporary application of clamp forceps. If necessary a spirting vessel is tied and the ligature cut short. Portions of tissue which have been compressed by the clamp forceps should be excised before tying the sutures, as they are apt to interfere with union by first intention. Carefully applied sutures offer the best means of checking hemorrhage.

Silk may be used if the operation is not followed at once by kolpoperineorrhaphy. Otherwise it is preferable to use wire, because the sutures must remain a long time.

(B). *Posterior Elytrorrhaphy.*

The excision of elliptical pieces from the posterior vaginal wall is indicated when the latter is unusually flabby and wrinkled. We may help ourselves, in such cases, by making very extensive denudation in kolpoperineorrhaphy, but the wound then becomes unusually large, the halves are not apt to be symmetrical and too much must be corrected by sutures. The latter operation also lasts very long, and the coaptation is not as accurate as when smaller wounds are made. It is therefore preferable to excise vaginal flaps separately, and then to perform kolpoperineorrhaphy, either at once or after the parts have healed. In such cases we will generally be compelled to perform anterior elytrorrhaphy first, and to follow this by posterior elytrorrhaphy in the same sitting. The main operation is performed after the parts have healed.

Posterior elytrorrhaphy is also indicated when the prolapse of the posterior vaginal wall is the result of markedly hypertrophic ectropium of the mucosa and sub-mucosa. Elytrorrhaphy is then indicated so much more urgently prior to the main operation, because the removal of the elephantiatic tissue by kolpoperineorrhaphy would necessitate the formation of an often enormous raw surface.

Apart from a few modifications the technique of the operation is the same as that of anterior elytrorrhaphy. We prefer the excision of folds which are grasped in clamp apparatus.

The opening of Douglas's sac cannot always be prevented. Dissection of the flaps offers more security against this accident than the method of clamping a fold, but it likewise is not perfectly safe.

On the other hand the latter method is more advantageous, because the wound is closed so quickly that an incision into the peritoneum does not do much injury. However, this accident is rare, and we have observed it only a few times. In one case the projection of the posterior vaginal wall felt very compact, and its layers could be moved very little. After excision of the projecting part, the omentum, which was adherent to Douglas's sac, appeared in the wound, because a large piece of the peritoneum had been excised with the hyperplastic vaginal wall. The subsequent course was entirely favorable.

KOLPOPERINEORRHAPHY.

The object of this operation is the restoration of the vaginal sphincter apparatus. The latter is about 3 cm. in length, and its function is dependent mainly upon a good support for the lowermost part of the vagina. The main base is formed by the lower part of the recto-vaginal septum. The supports are laterally the pelvic fascia, anteriorly the urethra, which is fixed by the pelvic fascia and triangular ligament.

We are able not alone to restore the base of the sphincter apparatus, but we may even give it a firmness greater than normal. By utilizing the tissues on both sides of the vagina we can replace the support lost by the stretching and even the rupture of the pelvic fascia.

The various chief methods of kolpoperineorrhaphy have much in common. In all a large raw surface is made on the posterior wall of the vagina, the vulva being denuded in various degrees by different operators. The raw surface is divided into two equal lateral parts, and these are brought in contact by means of sutures. This draws the tissues on the sides of the raw surface towards the median sagittal plane, and thus enlarges the sagittal diameter of the wedge-shape masses of tissue which are known as recto-vaginal septum and perineum. The main base of the sphincter apparatus, and the lateral support of that part of the vagina near the denudation, are thus restored. All the methods are thus founded on a correct physiological principle.

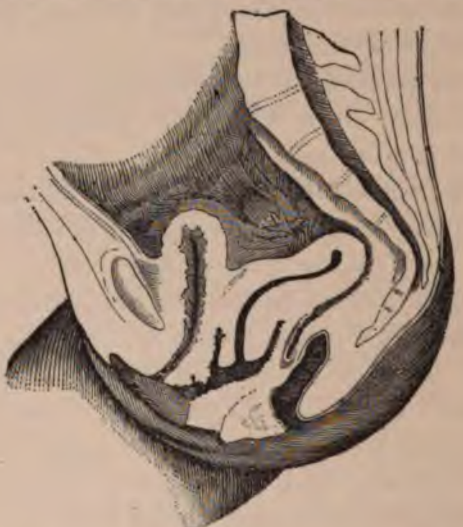

FIG. 221.

Fig. 221, taken from an individual who died soon after a successful operation, illustrates the relations in a sagittal plane. The triangular newly formed portion of the recto-vaginal septum is situated directly upon the lower portion of the septum, which had remained intact.[1]

The various operations differ very materially in the size and shape of the denuded parts of the posterior vaginal wall and introitus. Superiorly the denudation may extend very far or only a little towards the fornix. Inferiorly the posterior commissure or a cicatrix in the perineum forms a fixed boundary.

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[1] Amputation of the hypertrophic cervix had been indicated in this case.

The denudation may also possess various widths both in the upper and lower parts. Curved incisions may be made from the raphe of the perineum, extending very far laterally, surrounding the labia majora or entering their substance, *i.e.*, the vulva may be included in the denuded parts. These incisions may extend more or less upwards towards the level of the urethral meatus.

The incisions may also pass from the posterior commissure upwards towards the level of the urethral meatus, sparing the labia majora, and either involving or sparing the labia minora.

Further, internally the width of the wound finds certain limits. If it is made too far to the side, we come in contact with large venous plexuses, and, on account of the firm connection of the vagina with the descending ramus of the pubis, are apt to encouunter excessive tension, which is injurious to union by first intention.

The restoration of a normally acting sphincter apparatus is shown by the fact that the urethral ridge of the vagina rests firmly on the posterior vaginal wall. As a matter of course this can only be attained if a firm base is made farther up, at least to the extent of the previous intact sphincter apparatus. Artificial elongation towards the vulva to any marked extent does not seem to be necessary, except perhaps in certain special cases.

From the remarks made it would appear that the formation of a normal sphincter apparatus does not require a very long denudation. In mild cases a very small raw surface suffices to produce conditions such as obtain in virgins. Not infrequently, however, the wound must be made much larger. Not alone the floor of the pelvis, but the peritoneal supports are secondarily or primarily insufficient in prolapsus; as the latter cannot be restored we must endeavor to replace it by strengthening the floor of the pelvis beyond the normal.

The wall of the vagina, in its upper part, is often so flabby and hypertrophic, and its connections are so loose, that it projects not infrequently in shapeless ridges into the lumen of the canal. This would gradually make its way into and dilate even a very firm and narrow sphincter apparatus. This is best avoided by making the raw surfaces project into the upper part of the vagina. If necessary, a special elytrorrhaphy must be performed in order to effect this object.

Although basing his plan on other theoretical views, and with the intention of placing a firm barrier, in the shape of a prominent ridge in front of the uterus, Simon was the first to consider the most important circumstance. But on account of its relative shortness, his denudation was unusually broad, and involved particularly the lateral parts inside of the introitus, a place at which, for reasons mentioned above, extensive denudation is not desirable. Hegar endeavored to avoid this evil by extending the denudation along the long axis of the vagina, and therefore made it narrower in the part adjacent to the introitus. Like other operators, he had learned by experience that extensive denudation in the latter position is apt to prevent union by first intention. It is this point which has given rise recently to further modifications of the operation.

Bischoff made the beginning by ingeniously placing a flap, which was cut from the columna and separated from its base, upon a very broad, large raw surface of the vagina, or this combined with the vulva, so that the lower end of the flap formed the posterior commissure. The vaginal closure was thus displaced farther anteriorly, inasmuch as the labia majora were also denuded extensively. The utilization of the columna seems to us to be based on a correct idea. Deep and extensive lacerations are often produced during delivery on one or both sides of the columna. Not infrequently there is also a transverse laceration a little behind the posterior commissure, and even the columna may be more or less separated from its base. The body of the perineum subsequently sinks downward, and the carina vaginæ has no support. But whether this notion is properly applied in Bischoff's method, appears to us doubtful. The lower end of the flap, which is cut from the columna, is applied to a part which is much higher and further forward than under normal conditions.

Bischoff, like Simon, starts with the idea of making an extensive barrier, and the marked flexion of the vagina in its lower part is to act in this way. He also states that the cervix uteri, when it descends sufficiently to reach the oblique plane of the newly-formed ridge, will slide backwards along it and will be caught in the flabby part of the vagina behind the ridge, as in a pocket. This produces anteversion of the uterus, a condition which is unfavorable to the development of prolapse. Numerous examinations of prolapses, that had long been cured, have shown that such a condition is very rare and not at all necessary to recovery.

Martin also utilizes the columna. He does not make a flap, but allows the middle portion of the columna to remain, and makes a raw surface on each side extending deep into the vagina. The tip of the columna is not brought into the posterior commissure. Martin's intention is simply that of avoiding excessive tension near the introitus.

After this glance at the various methods we turn to the technique of the operation, at the same time discussing a few peculiar effects.

Simon's method consists in denuding a trapezoidal surface of the posterior vaginal wall and vulva (Fig. 222). The breadth of the base line along the posterior commissure is 5 to 6 cm., and the length of the vaginal portion is about the same.

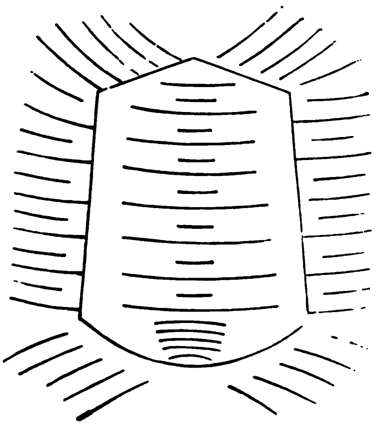

FIG. 222.

The width of the raw surface diminishes slightly (about 1 cm.) as it ascends the vagina. The superior boundary has the shape of an oblique angle, so that the surface has five angles. In the application of the sutures (silk) those in the vagina play the principal part. The perineal sutures should not be inserted deeper than 1½ cm.

Simon employs specula with two or three fenestræ (Fig. 223, *a, b, c, d, e,*) for making the field of operation tense, and forceps with several hooks (Fig. 224) for grasping the flap. He uses a bistoury for denuding and scissors curved on the flat for smoothing the wound. Later it is said that Simon used scissors almost exclusively, by excising narrow strips of the mucosa.

Hegar's method differs from Simon's in the triangular shape of the raw surface, and the mode of exposure.

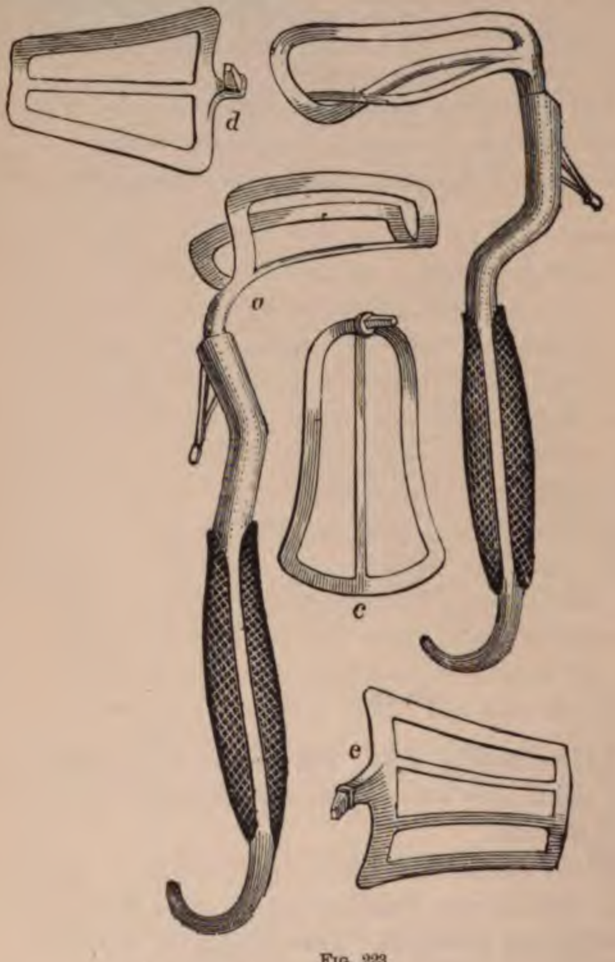

Fig. 223.

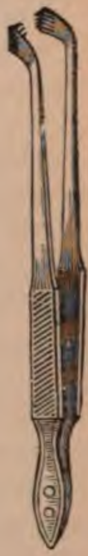

Fig. 224.

Before the operation the parts are carefully inspected one or more times, at first without any other assistance than separation of the labia with the fingers after pushing back the prolapse. It will often be noticed that the lateral halves of the vagina and vulva are more or less asymmetrical, whether old fissures and cicatrices are present or not. The columna in particular has a different shape and direction. If a forceps is inserted in the vagina at a point corresponding to the upper angle of the raw surface, about to be made, and this is drawn forwards and upwards, two folds will pass to both sides of the introitus, enclosing a triangular space In favorable cases this triangle has equal angles, and its entire surface presents no notable irregularities. But it will very often be found that the folds possess different lengths, are not prominent here and there, and that the surface contains depressions on one side of the median line, but none on the other side. If we should cut along the folds and dissect the intervening mucosa, not alone would the edges of the wound not be uniform, but the lateral halves would also be unequal. On one side we enter deeply into the depression, which is rich in veins, along the columna, on the other side this part is spared. The result is changed by various experiments with the application of the forceps in different places, so that we are soon able to determine the most favorable conditions in the concrete case. We should also test the tension of the parts, and, so far as possible, should draw together the surfaces which are to be denuded. Finally, we must arrive at a conclusion concerning the length and breadth

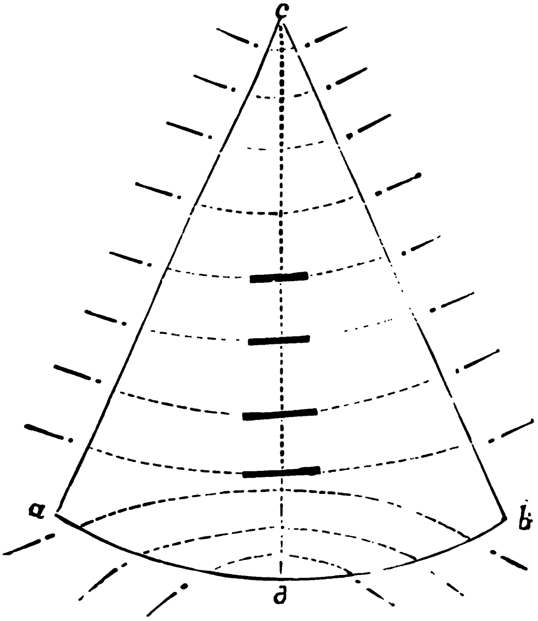

FIG. 25.

of the part to be excised. This depends chiefly on the degree of prolapse; the more severe the latter, the longer and broader the triangle. In mild cases the base of the triangle need not be more than 4 to 5 cm. wide, its height about 5 cm. (Fig. 225.)

In severe prolapse, the base may be increased to 7 cm., the height to 9 cm. (Fig. 226). Other factors must also be taken into consideration. The triangle must be larger in individuals who work hard. If the anterior vaginal wall will probably remain flabby, despite anterior elytrorrhaphy, and there is considerable cystocele, the denudation of the external genitals must be made broader and even longer. If the posterior vaginal wall is very flabby, and bag-shaped, the pouch must be denuded more or less, unless we prefer a special posterior elytrorrhaphy.

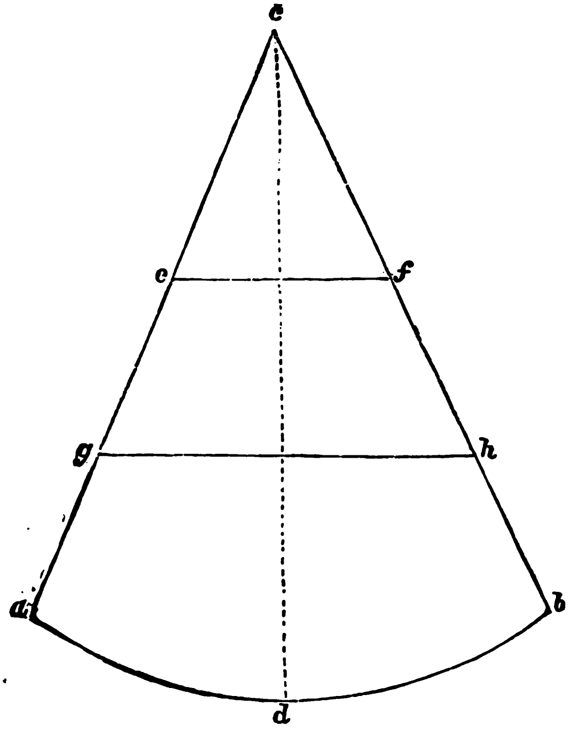

FIG. 226.

A laxative is administered the day before the operation, and the parts are cleaned by disinfecting irrigations. Occasional disinfectant irrigations will suffice during the operation. The rectum is to be cleansed a number of times with chlorinated or salicylated water before and during the operation. The latter is performed in the ordinary lithotomy position.

Four or five assistants are required, two for holding the legs and fixing the volsellæ needed in exposure of the parts. A third hands the instruments and a fourth administers the anæsthetic; this is absolutely necessary, as the operation is extremely painful. Schraum has recently effected local anæsthesia by applying a 20 per cent. solution of cocaine five times during the operation.

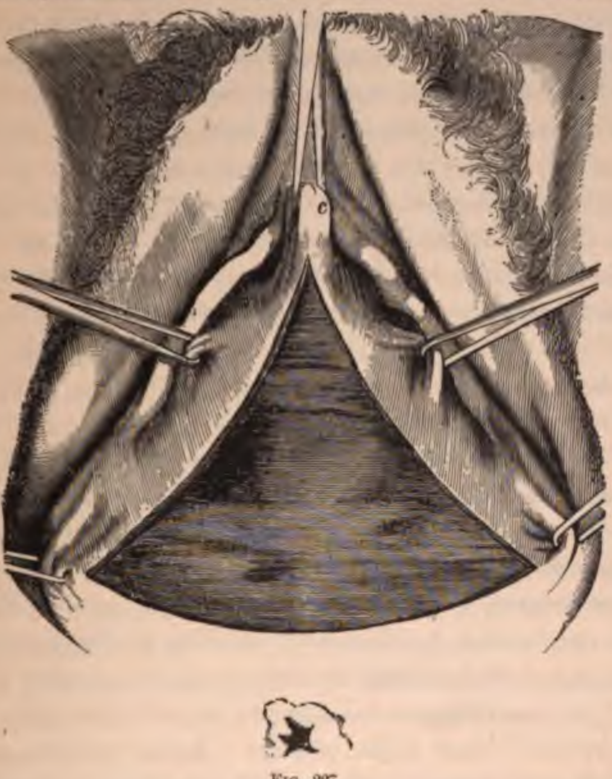

FIG. 227.

The instruments required are: three volsellæ, a few tenacula, with one or two hooks for greater unfolding of the field of operation, a small broad bistoury, a pair of scissors bent on the flat, a long hooked forceps, artery forceps, numerous smaller and larger, more or less curved needles, wire, fine silk, catgut, straight scissors for cutting the sutures, sponges, sponge-holders, irrigator.

The field of operation must first be exposed and made tense. This is done by means of hooked forceps (Fig. 227). The upper angle of the wound, which is first grasped, is drawn upwards and forwards, so that the posterior vaginal wall stands almost vertical to the operator in the introitus. Two other forceps (*a* and *b*) are then applied 3 to 4 cm. from the raphe of the perineum in the lowest part of the labia majora. The triangle (*a*, *b*, *c*) which is to be denuded, is thus mapped out.

The base runs along the posterior commissure and has a curved shape. The drawing up of the upper angle may be effected with a hooked forceps, and this is advantageous in making the incision which bounds the triangle. The artificial tension is apt to move the parts in an unnatural manner, so that without it a better triangle is obtained.

The flap is now dissected. The two boundary incisions *ac* and *bc* are made; the apex of the flap is grasped with hooked forceps, and dissected. When the apex is free, it is best to dissect for a short distance along the lateral incisions, and then dissect further from above, until the apex can be grasped with the fingers. This is then drawn downwards. The flap may now be separated from its base, partly by traction, partly with the bistoury, whose tip is always turned towards the flap. I do not think it advisable to separate the flap by traction alone, as Bischoff advises. Firmer connections are found in places, and the tissue is then torn too deeply and irregularly. It is well to separate now from the right, now from the left side. If the septum is very thin and we fear that the intestine may be entered, a finger is introduced into the rectum, the septum pushed forwards, and the thumb employed to fix the flaps below. A great advantage is derived from the ability to use the bistoury with either hand. If the hemorrhage is considerable and interferes with vision, irrigation is made under slight pressure. Larger spirting vessels are grasped with artery forceps. When the vicinity of the posterior commissure is reached, the flap is lifted up with one hand and the boundary incision is made along the posterior commissure. A few strokes of the knife suffice to remove the flap completely. The entire dissection is usually finished in three to five minutes. The more rapidly it is done, the less the hemorrhage. The latter often ceases spontaneously as soon as the flap is removed, or it is controlled completely by pressure between the fingers on the raw surface and in the rectum.

The thickness of the flap depends on the character of the tissue, which is determined by the finger introduced into the rectum. As a general thing, a thickness of a few millimetres will suffice, but it must be made thicker if the tissue is hyperplastic, callous and contains little blood.

When denudation is complete, the part is smoothed with scissors, the raw surface being pushed forward by the finger in the rectum. Islets of mucous membrane must be carefully removed. But too much time should not be consumed in this procedure, since an absolutely smooth surface can not be produced. The removal of the larger prominences and inequalities will suffice. The wound is then carefully irrigated, and larger spirting vessels are tied with catgut. Prominent veins in the base of the wound are cut through in order that they may retract. If they are thrombosed, the clots are squeezed out.

The last stage of the operation consists of the introduction of the sutures. This is done according to the rules laid down in Vol. I., p. 155 *et seq.* The insertion of a sufficient number of deep sutures extending beneath the entire base of the wound, is absolutely necessary in order to prevent the accumulation of blood and the secretion of the wound. These sutures are introduced at intervals of 1 to 1½ cm. Between each two deep sutures is applied a superficial one to secure firm closure of the outer edges of the wound and prevent the entrance of vaginal secretion. A moderately deep suture is occasionally necessary. If the edges of the wound manifest a decided tendency to turn in, the superficial sutures are tied before the deep ones. The coaptation is begun at the apex, and as soon as two to three sutures are introduced they are tied. By this method we can tell whether the sutures correspond and the raw surfaces coaptate well, and if necessary, can correct the denudation in time by sutures or slight modifications. At the same time excessive, projecting tissue can yet be removed with scissors.

It is difficult to answer the question as to how firmly the sutures should be tied. Simon advises that they be not tied too firmly, especially the superficial ones, as they are apt to cut through. But this is of less importance. If the deep sutures are tied too loosely, we risk the danger of accumulation of secretion; if too firmly, they cut through, or, what is more serious, the constricted tissues become necrotic. With silk sutures the degree of firmness is difficult to determine; it is easy with wire sutures. The latter cannot be tied so tightly as to constrict the tissues to an excessive degree, and even if this should happen, they would rapidly cut through to a sufficient extent to afford relief. Wire sutures may therefore be tied as firmly as possible, and we prefer them, on this account, in vaginal sutures. In addition they do not swell and absorb injurious substances by capillary attraction, like silk and catgut.

The vaginal sutures play the principal part in kolpoperineorrhaphy. They are usually extended so low that the perineal sutures need only be inserted 1½ cm., though there are exceptions to this rule. It may be found that the lateral portions of the wound can not be coaptated by the deep vaginal sutures or that the tension is excessive. We then introduce only superficial or moderately deep vaginal sutures and pass to perineal sutures. If we are undecided, trial may be made of this or that suture in order to see what effect is produced. If necessary, an unsuitable suture may be rapidly removed. The perineal sutures are usually of silk.

Werth, who makes very broad raw surfaces, recommends catgut sutures in order to unite first the deep parts of the wound. These sutures are tied, cut short, and then the surfaces near the edge of the wound are united in the usual way. This forms sutures by strata. If necessary several such strata may be introduced. The principle is correct, inasmuch as good coaptation is secured deep in the wound. But it must not be supposed that these sutures will entirely prevent the evil results of a too broad denudation and the tension caused thereby. We regard it as a mistake to make the denudation so broad that we are unable to coaptate conveniently with ordinary deep sutures. But sutures in strata may be useful to less skilled operators, inasmuch as the wrong distribution and direction of the sutures are more easily avoided. This mistake is particularly injurious in complicated rupture of the perineum, in which peculiar fissures deep down suddenly become visible, after the entire tissue was supposed to have been coaptated. As the raw surface in the perineal plastic operation is very small, its size cannot be the cause of this peculiarity as it may be in kolpoperineorrhaphy.

Our results with wire sutures are so remarkably favorable that we can find no reason for their discontinuance. Nor can we conceal our fears of a large mass of retained suture material, especially in the vicinity of such mucous membranes as the vagina and rectum. The catgut suture is apt to become loose, and draws up if it is continuous. At all events the question must be decided by further experience.

After the sutures are tied the vagina is carefully irrigated.

In very extensive prolapse the denudation must be correspondingly larger. The upper angle of the wound then extends to 2 to 3 cm. from the portio vaginalis. Under such circumstances the portio is easily drawn into the introitus and there lifted upwards. If necessary we may dissect in sections,—for example, first make tense and denude the triangle *e c f*, then the trapezoids *e f g h* and *a b g h* (Fig. 226). If the hemorrhage is considerable the first section may be sutured before proceeding to the next. But this is not often necessary, and, as a general thing, we prefer to make preliminary simple elytrorrhaphies in cases of very flabby posterior vaginal wall and extensive prolapse.

In very marked cystocele, which is not corrected sufficiently by the anterior elytrorrhaphy, the denudation must be broader below, so that, if necessary, it extends to the level of the middle portion of the labia majora. It may be also elongated inferiorly, so that the labia majora are partly included, but this is rarely necessary.

The greatest difficulty arises from deep furrows and cicatricial retractions, which are found upon one or both sides of the columna. The normal depressions may be excessively developed, and this must be taken into consideration in paring the parts. If the denudation is too broad at the parts in question, coaptation with sutures becomes difficult on account of the great tension. This shows that we have gone too far. If the retractions result from cicatrices, they must be excised. The wound must then be enlarged occasionally in one half of the triangle, but the inequality is never so great that it cannot be corrected by the sutures. However, such conditions are rare, inasmuch as the cicatrices are usually situated only in the lowest part of the vagina, where the denuded parts are always broader.

During the introduction of the sutures it is sometimes found that more tissue is left over at one edge of the wound than at the other.

The plan described in Vol. I., p. 155 *et seq.* usually furnishes a sufficient correction. It is rare that the formation of a fold of the longer edge of the wound, described in that section, will become necessary. In many cases we can also help ourselves by elongating the short edge of the wound in the introitus.

The hemorrhage during the operation is sometimes very considerable, but we have never seen it become dangerous.

The after-treatment is very simple. If it is at all possible the patient should micturate voluntarily. We generally allow solid but light food on the day after the operation, and give a laxative on the third or fourth day. Vaginal irrigations are not made in the beginning, and are only ordered if there is marked secretion from the vagina and the wound or febrile movement. The perineal sutures are removed on the fifth to sixth day, and the patients are allowed to leave the bed. They are generally discharged on the fourteenth day with the necessary directions (avoidance of heavy manual labor or coitus, regulation of the bowels and micturition). They are instructed to return in four to six weeks for the removal of the vaginal sutures. The sutures next to the introitus must be removed before the discharge of the patients, in order to avoid disagreeable irritation.

The surgeons who have operated according to our method have experienced most difficulty in coaptation of the raw surfaces for a short distance within the introitus. Coaptation and union by first intention are secured much more easily in the deeper parts of the vagina. We readily grant that this difficulty is experienced, but as the part in question is the one upon whose firmness the most depends, all modes of operation will meet with the same difficulty. Greater extension of the wound towards the vulva will furnish an unsatisfactory substitute for good vaginal closure in the deeper parts. Greater extension of the wound within the vagina meets with technical difficulties. It seems to us that too much is often attempted, and that union is prevented by excessively wide denudation. But it is perhaps possible that by modifications in the incisions, by sparing the middle portion of the columna, and drawing it down to a moderate extent by means of sutures, union by first intention and at the same time the requisite tension, may be secured more easily.

Martin, who has this object in view, describes his operation as follows: the posterior vaginal wall is made tense, as in Hegar's operation, by means of two forceps inserted below the fornix (Fig. 228). As a rule the columna is then distinctly marked as a median ridge; if not, it is easily felt. If the columna cannot be recognized even in this way, its position can be determined by replacing the vaginal wall *in situ*. Incisions are made on the sides of the columna. Then the lateral folds of the vagina, lying along side the columna, are made tense and dissected up (1234). The separated flaps are allowed to hang over the introitus below 1 and 4. The raw surfaces are now united by sutures passing from *A* to *A* and *B* to *B*. A part of the line 3, 4 is left for stitching the lower edge of the flap towards *x*.

In the introitus the incisions 4 *I* are now made towards the sides, about half way up the introitus, and the ends of these incisions (I I) are united by a curved incision which passes along the posterior commissure or the boundary between the integument and mucous membrane. The surface thus marked out is dissected, the flaps 1, 2, 3, 4 falling off at the same time. Deep sutures then unite the points 4 with *x*, then B with B, *e* with *e*. 8 with 8. Finally, *a* is united to *a*, *b* to *b*, *c* to *c*, and *d* to *d*.

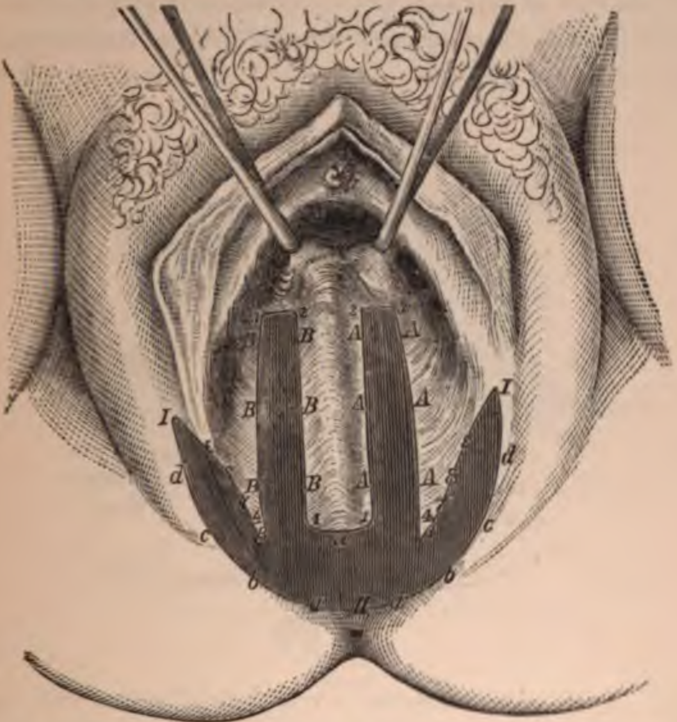

FIG. 228.

Martin has obtained good results as regards union by first intention. The results with regard to permanent retention are not mentioned.

A priori we entertain some doubt that the requisite firmness near the introitus will be attained. The denudation necessary would have to extend too far to the side, and thus involve those structures which it is best to spare. It would be better to spare only the middle part of the columna, and to make the lateral wounds in the lateral parts of this structure. We then would pass very little or not at all into the vascular depressions on both sides of the columna. Perhaps Martin has really done this, although from the description it would seem as if he spared the columna *in toto*. Moreover, the columna is often such a shapeless ridge that its removal, even in great part, is imperatively demanded.

In Bischoff's operation the columna is also spared, but in a different way from that described in Martin's operation. It is separated from its base and converted into a flap (Fig. 229). Without any special tension of the field of operation (merely by exposure with the hands) the knife is inserted at the boundary between the vaginal mucous membrane and the skin in the middle of the posterior circumference of the vulva, and a flap 4 to 6 cm. long and 2½ cm. wide is cut around the columna. This flap is separated at the tip by a few strokes of the knife, and then separated entirely with the aid of the nails and the handle of the scalpel. Starting from the base of the flap a transverse incision is made on both sides outward to the level of the middle of both nymphæ. If there is an excess of mucous membrane, the incision is slightly curved (concavity toward the flap) towards the nymphæ. The triangle thus mapped out is now separated from its apex, *i. e.*, from the vagina. At the present time Bischoff denudes the lateral parts before the middle flap is drawn off, in

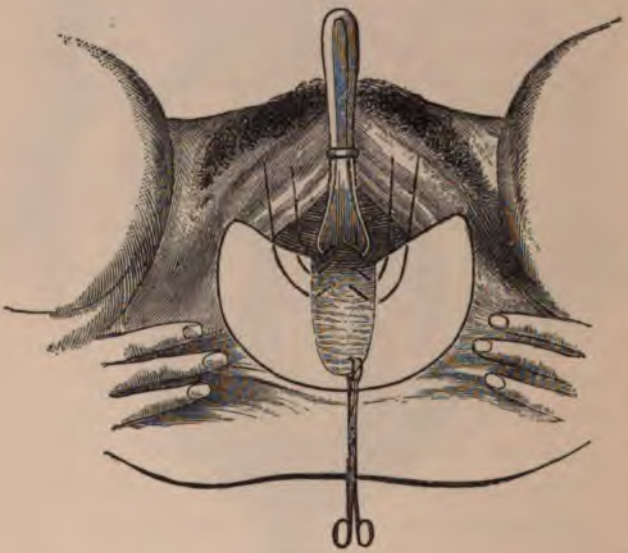

FIG. 229.

order that the blood flowing from the latter may not conceal the field of operation. The last stage of denudation consists in the removal of a "U" shaped piece of tissue from the posterior half of the vulva. The straight limbs of the U ascend on both sides to the middle of the labia minora and here unite with the lateral denudation of the vagina. The removed tissues belong in part to the labia minora, in part to the labia majora and posterior commissure. The parts are removed with a sort of rivet. If a small bridge remains at the posterior commissure, it is removed with the scissors or bistoury.

The flap is then fixed by sutures. This is done by uniting the edges of the flap, with catgut sutures, to the transverse edges of the lateral denuded surfaces. Silver wire is used for the subsequent perineal sutures. Long, lancet-shaped needles are inserted 3 cm. from the edge of the wound, at intervals of 1 to 1½ cm., the entire thickness of the perineum is included, and the needles withdrawn on the other side. If the hemorrhage is considerable, the flap is grasped by one or two of these sutures, in order that no blood or secretion may stagnate beneath it. Fine silk is used in the formation of the posterior commissure at the apex of the flap, and the sutures tied loosely. Bischoff subsequently used Werth's sutures in strata with sunken catgut ligatures. Bischoff uses them from the perineum, first forming a stratum at the bottom of the

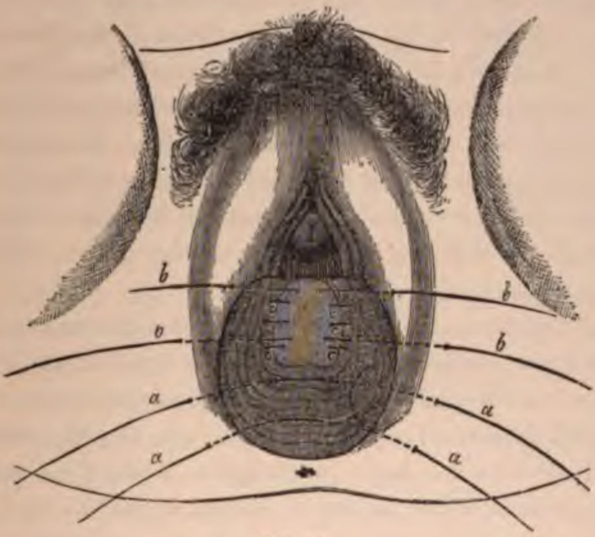

FIG. 230.

wound, *i. e.*, corresponding to the base of the flap, and then passing gradually by 3 to 4 (!!) strata, to the surface.

We have previously said that Bischoff's operation pays very little consideration to the natural relations. The posterior commissure is placed in a position which is higher and further forward than normal. The columna here extends hardly to the edges of the hymen. The extensive denudation of the vulva, especially of the labia majora, is a step backward to the old episiorrhaphy of Fricke and Kuechler.

There are also technical objections to the operation. The insertion of such deep sutures from the perineum is certainly not advantageous. They are to be introduced 3 cm. (!!) from the edge of the wound, and must then be pushed in 5 to 6 cm. to the region of the base of the flap. They thus include a remarkably large amount of tissue. In the operations of Simon and Hegar this part of the procedure is allotted to vaginal and perineal sutures,—an undoubtedly better plan. Whether the sunken catgut sutures which Bischoff has tried recently—evidently in order to obviate this difficulty—will act well, must be decided by further experience. At all events the value of a large number of these sutures in 3 to 4 strata (!!) appears very problematical.

Union of the flap has not always been secured by some operators. *A priori* this is not astonishing, inasmuch as the flap floats somewhat in the air, and blood and wound secretions are apt to accumulate beneath it. If this is apprehended and the perineal sutures are, in part, passed through the flap, their direction must be changed. While some pass parallel to the raw surface towards the base of the flap, the others must be inserted further upwards in the direction towards the anterior vaginal wall. Whether this difference in direction acts well, appears to us to be doubtful.

ACCIDENTS DURING AND AFTER KOLPOPERINEORRHAPHY.—FINAL RESULTS.

Injury to the peritoneum and severe hemorrhage during the operation have already been discussed.

Secondary hemorrhages are extremely rare if the sutures are properly applied. We have seen three cases. In one, a vaginal artery, quite far from the introitus, bled about six hours after the operation. The hemorrhage was checked by ligature, without necessitating the removal of the sutures.

In another case an artery at the introitus bled on the 12th day. The bleeding was quite considerable before assistance was obtained. In the third case secondary hemorrhage occurred on the 12th day from an artery situated deep in the vagina. It was only exposed after partial separation of the united parts. Since then we always ligate larger arteries. It is sometimes difficult to distinguish such a hemorrhage, if it is not severe from the start, from the hemorrhage of normal or premature menstruation. Differential data are furnished by calculating the period of mentruation and by the sensations of the patient. But in many cases we must expose the parts as thoroughly as possible without traction on the united wound, and must ascertain the source of hemorrhage by the sense of sight. If this proves unsuccessful and the bleeding becomes severe, nothing is left but the removal of the sutures.

Catarrh of the bladder was not infrequent before we limited the use of the catheter as much as possible.

In profuse secretion from the vagina and suppuration irrigations are necessary; the tube must be introduced as close as possible to the anterior vaginal wall.

Small abscesses in the vagina, corresponding to the sutures, occur occasionally and give rise to slight fever. They usually open spontaneously through the suture canals. If necessary they are opened with a bistoury introduced along the index finger.

Among 400 operations in our Clinic there were 2 deaths from pyæmia and septicæmia. They were both due to the neglect of the precaution that an operation should be delayed for some time after coming in contact with septicæmic patients.

As a general thing the results with regard to union by first intention are very favorable, and those with regard to the subsequent relief of the prolapse are equally favorable.

In 1880, our former assistant, Dr. Dorff, collated 136 operations (Wien. Med. Blaetter, 1879, 47 52, and 1880, 1, 4, 5), paying special attention to the final results. In only 63 cases could a personal examination be made or an accurate account obtained. In 53 the prolapse remained cured at the end of a long time (10 years in some cases), and 9 had given birth to children without suffering injury. In 10 cases the result was either bad from the start on account of insufficient union by first intention, or it was subsequently lost on account of yielding of the cicatrix or parturition (2 cases).

Our present results are much more favorable. In the last 3½ years more than 150 operations were performed. We do not know of a single failure, and the confidence of the country people in the operation is constantly increasing.

As almost all our patients must perform hard manual labor, the above-mentioned results are certainly very favorable.

U. A. Freund (Gynækol. Klinik. p. 338) has recently called special attention to the prophylaxis of prolapse. We might agree with his views were it not that, at the same time, unwarranted objections are made to the operative treatment. Freund pretends not to give an opinion concerning the operation when he states that it not infrequently is attended with considerable loss of blood, requires two to three weeks rest in bed, and does not guard against relapses if the patient, who is at the period of sexual activity, retains a distensible vagina whose folds are not destroyed. In the interests of the operation, which we consider the most useful one in gynecology, we must here make a few remarks. Freund assures us that he does not intend to express a general opinion on the question, but his objections really refer to prolapse operations on the whole.

The objection that the patient must be kept in bed two weeks after the operation need hardly be considered. Freund himself, in his plan of treatment, keeps the puerperal woman in a horizontal position for *six weeks*, and then requires her for four weeks to wear a cotton tampon during the day.

The loss of blood during the operation may be kept within narrow limits. In anterior elytrorrhaphy it may be reduced to a minimum by the method to be described below. In kolpoperineorrhaphy the bleeding may be checked by rapid separation of the flap, compression, the use of clamp forceps and the rapid introduction of a few deep sutures. But as a general thing there is nothing to fear, and the patients usually recover very quickly.

In women who are still sexually active the danger of relapse is only present when an insufficient denudation has been made in an extensive prolapse. Freund's objection therefore refers only to some of the operations in sexually active patients and fortunately not to the majority. In some cases we must expose the patient to the danger of a relapse—not in order that the patient may not be "mutilated," as Freund states, but in order to avoid extensive rupture during a subsequent parturition. Even in such cases we may be of some assistance, by gradual dilatation before delivery, or, if necessary, by a sufficient incision in the median line before the head of the child has injured the parts too seriously, and then uniting the incision after delivery. But the risk of relapse is always preferable to excessive denudation. The operation is so free from danger that we need not fear its occasional repetition.

The term "mutilation" which Freund uses can only be applied to the extensive denudations which are necessary in severe prolapse. But we must ask ourselves, what is mutilation? A prolapse projecting five to ten cm. from the vulva, with inverted vagina, ulcerated cervix, peritoneal fold and bladder, or a vaginal sphincter apparatus which is somewhat more extensive than normal? If any operation merits the title plastic it is perineorrhaphy, and it is wrong to call it a mutilating operation, because it does not completely restore the natural conditions. Moreover, the very extensive denudations must be made very often in women who are near or even beyond the menopause.

One good effect of the operation, which Freund has entirely forgotten to mention, consists in the fact that it secures closure of the introitus and thus guards against mechanical and chemical irritations of all kinds, but especially against the entrance of infectious substances.

Good results from prophylactic treatment may be looked for only in conditions of relaxation of the tissues which serve to support the pelvic viscera. Not much can be expected in the more considerable lacerations, and even in the former case success is by no means assured. How rarely is a simple relaxation-retroversion cured? Moreover, Freund's method is very rarely practicable among the class of the community in whom the large majority of prolapses are found. A peasant woman or the wife of a laborer will not go to bed for six weeks, and then introduce an alum glycerine tampon every morning for four weeks to remove it at night and make an injection.

Freund's method does not even appear to us to be useful, and we would caution against its employment. Whatever can be effected by horizontal decubitus, may be attained in three weeks. The stretched tissues may regain their elasticity in great part and small ruptures may unite quite firmly. Much depends, in these respects, upon the condition of the digestion, nutrition, and the blood-producing function. If a puerperal woman is allowed to remain in bed for a longer time, these important factors will suffer. The mental disposition is depressed, the appetite suffers, digestion is impaired, and the abdomen often becomes tympanitic. The circulation of blood is considerably impaired by the want of muscular activity, and the production of blood also suffers, especially on account of the want of fresh air. In short, the advantages to be derived from the horizontal position are more than counterbalanced by the evils resulting therefrom.

Short but frequently repeated walks, alternating with horizontal decubitus, cold washings, the use of electricity and suitable gymnastics for strengthening the muscles, especially of the abdominal and pelvic walls, are the measures which may be used to advantage in the latter part of childbed.

Relapses after parturition cannot always be prevented. It is astonishing that the vagina does not rupture more frequently, during delivery, after the operation for prolapse than it really does, since, in severe cases, the vaginal closure must be made more complete than normally. But in performing the operation due consideration may be paid to the occurrence of subsequent parturition, and the denudation may be made as small as possible. In this respect we regard the distribution of the denudation over a longer stretch of the vagina as more suitable than a too broad denudation over a shorter area. The patient must be directed that, in the event of a subsequent delivery, proper assistance be obtained for the support of the perineum.

In conclusion we may refer briefly to Neugebauer's and Winckel's operations.

Neugebauer calls his method median vaginal suture (Centralbl. f. Gynaek., 1885, p. 3 and 26). From the median part of the anterior and posterior vaginal walls is removed a flap of mucous membrane four cm. long and eighteen mm. wide, with rounded upper and lower borders; the lower edge is about two to three cm. above the vaginal opening. The raw surfaces are united with wire sutures.

This operation is hardly suitable in sexually active individuals. The results do not appear to be bad, but there is no collection of a large series of operations.

Winckel narrows the vagina from the posterior and lateral walls. The denudation begins immediately behind the hymen. From the middle of the posterior vaginal wall two flaps (two to two and one-half cm. wide, six cm. long) are removed in a lateral direction, *i.e.*, towards the right and left side. The flaps remained connected with the vagina at their base but are shortened to three cm. They are united above the raw surfaces, then the latter are brought together, and finally the edges of the flaps are united.

OPERATIONS IN VAGINAL CYSTS.

Vaginal cysts, which possess surgical interest on account of their size, are quite rare. Some are covered merely by a thin layer of mucous membrane, others are interstitial and situated within the fibro-muscular layer of the vagina, or subserous and situated in the para-vaginal cellular tissue beneath the floor of Douglas's sac or between the vagina and rectum. They are found with equal frequency on the anterior and posterior walls, but are more rare on the lateral walls of the canal. In two thirds of the cases they occupy the lower half of the vagina. They develop as retention-cysts in the glands of the vaginal wall or in persistent rudiments of Gardner's canals or even of Mueller's duct. Some are derived from lymphangiectasiæ or encapsulated hæmatomata. Cysts within the uretho-vaginal septum may originate in grape-shaped glands or in diverticula of the urethra. Cysts are usually solitary, but occasionally from two to six are present. They may attain the size of a nut or even that of a fist. The thickness of their wall varies from one to ten mm. If it is very thick and firm, it is usually defined sharply against surrounding parts; in other cases it passes imperceptibly into the surrounding connective tissue, and is so thin that it shines through as a bluish mass. The contents are serous, synovia-like, or colloid; they often contain an admixture of blood. Kaltenbach observed a cyst with the structure of a proliferating cystoma, with partly papillary, partly glandular proliferations on the inner surface.

As a general thing the cysts do not give rise to symptoms until they have attained larger dimensions. They may interfere mechanically with micturition and sexual intercourse, and may displace the uterus. Or they cause annoyance by passing into the vulva and maintaining catarrhal secretions. In some cases they give rise to severe symptoms only during menstruation. In rare cases they constitute an obstacle to delivery.

Simple puncture or a short incision offers no security against the refilling of the cyst. Even subsequent cauterization with nitrate of silver or injections of tincture of iodine are not certainly effective, and sometimes give rise to inflammatory processes in surrounding parts. Drainage of the cyst through two remote openings also seems to be uncertain and difficult.

Apart from the rare pedunculated cysts, which may be ligatured, there are two rational methods of operation: (1), partial excision of a portion of the cyst wall; (2), complete extirpation.

Schröeder has modified the first method by removing with the scissors only that portion of the cyst which projects above the surface of the mucous membrane, and then uniting the entire circumference of the remainder of the cyst to the vaginal mucous membrane. This prevents the severe secondary hemorrhages which were formerly observed after partial excision. The inner wall of the cyst (provided originally with cylindrical epithelium), which is thus included in the vaginal surface, continues to secrete for a short time, and soon cannot be distinguished from the mucous membrane of the vagina.

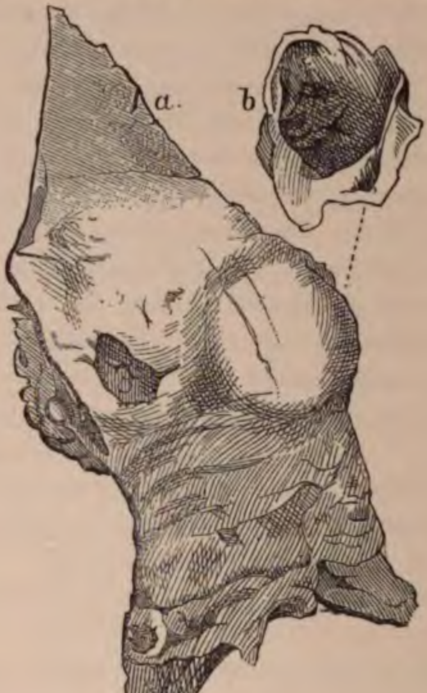

FIG. 231.

This method is especially adapted in thin-walled or sinuous cysts, which extend close to adjacent hollow viscera or to the peritoneum.

Total extirpation should be confined to interstitial or para-vaginal cysts with firm walls. It is necessary whenever the inner surface of the cyst manifests further processes of proliferation.

A longitudinal incision is made along the greatest diameter of the cyst, and the vagina then dissected from the cyst wall. If the wall is thick we endeavor to enucleate the cyst entire; if the wall is thin the cyst is apt to be injured, and we must extirpate the entire wall, laboriously, especially towards the sides. The wound is closed by deep sutures. Great caution is necessary when the cysts are situated high up in the recto-vaginal septum to prevent injury to the peritoneum, or injury to the rectum if they are situated more deeply. Kaltenbach extirpated the conglomerate cystoma shown in Fig. 231, in connection with an enveloping flap from the posterior, markedly prolapsed vaginal wall, and came in close contact with the rectal mucous membrane. The wound was closed with sutures from the sides, as in kolpoperineorrhaphy, and united by first intention.

EXTIRPATION OF INTERSTITIAL VAGINAL TUMORS.

Fibromata are the most frequent interstitial tumors of the vaginal wall, but sarcoma also occurs primarily or as local relapses (after sarcomatous disease of the uterus) in the shape of round, circumscribed tumors, imbedded beneath the mucous membrane.

As a general thing, it is only when the tumors are situated in the anterior wall that they project into the lumen of the vagina. Otherwise they project, on account of the firmness of the vaginal mucosa, externally towards the para-vaginal cellular tissue, or both towards the vagina and rectum. The fibromata rarely attain the size of a walnut or egg. In Ollivier's and Jacob's cases they weighed more than two kilo. Small tumors are round, larger ones are somewhat flattened.

The indication for the extirpation of these growths is furnished partly by their histological character, partly by local symptoms of irritation and compression or mechanical disturbances. As in the enucleation of vaginal cysts a longitudinal incision is made across the middle of the tumor; or a part of the covering mucosa is excised, and the tumor grasped with forceps. It is then separated from its capsule-like connective-tissue layer, partly by blunt instruments, partly by the knife and scissors. The remaining cavity is closed with deep sutures, after removing superfluous portions of the mucous membrane. If we are unable to pass the sutures beneath the entire base of the wound, the free escape of secretion must be secured by the insertion of drainage tubes or iodoform gauze in the remaining cavities. Some reports show that subperitoneal cervical myomata have been mistaken occasionally for interstitial vaginal tumors; this is also true of fibromata which started with a broad base from the inner surface of the cervix, and, after obliterating the latter (Fig. 159), descended far into the vagina.

EXTIRPATION OF BROAD-BASED NEOPLASMS OF THE VAGINAL MUCOSA.

These include certain benign papillary tumors, cancroids and sarcomata. The latter occur generally as a diffuse infiltration of the vaginal mucous membrane. But as the surface of these malignant tumors soon degenerates, they usually form easily bleeding tumor surfaces, surrounded by a hard wall and from whose base sprout papillary proliferations. In other cases we find one or more nodules, surrounded by infiltration. Primary cancroid and sarcoma of the vagina are very rare and extend rapidly to the surrounding tissues. On this account they are not the subject of operative interference. But the extirpation of the entire neoplasm with its base is indicated in all cases in which the adjacent lymphatics are not affected, and in which we may hope to pass the knife to the outside of the tumor. No consideration should be paid to the bladder and rectum in such cases, inasmuch as openings into these organs may be certainly healed by sutures if all morbid tissues have been removed. Thus, Schröeder successfully closed the opened Douglas's sac, and Fritsch healed a urethra-vaginal fistula which was produced during the operation.

The exposure of the field of operation is often very difficult in tumors of the fornix, especially in senile involution of the sexual organs. These obstacles must be overcome by drawing down the uterus with ligatures, lateral tension of the vagina, traction with sharp hooks on projecting folds of mucous membrane, and, if necessary, even by median division of the perineum and posterior vaginal wall. The diseased part is then circumcised with a knife, and is separated like a piece of sod from the underlying deeper healthy tissues. After its separation is complete, the bladder, urethra and rectal wall are generally exposed. The hemorrhage, as a rule, is quite severe. It is checked by ligature of the spirting vessels and the oozing tissues, and by the subsequent deep sutures. The direction of the line of union depends on the shape of the wound. Small wounds may be united in a longitudinal direction. Large or annular losses of substance require union in a transverse direction. The upper edge of the vaginal wound is stitched to the lower edge, which is not infrequently near or within the vulva, and the vagina is thus shortened. The insertion of flaps is occasionally very useful. If complete closure with sutures is impossible, the remaining cavities must be drained.

With the former insufficient means of disinfection the extirpation of malignant tumors of the vagina was a dangerous operation. Stasis of secretion in sinuses of the wound repeatedly gave rise to extensive phlegmons in the pelvic cellular tissue, and to fatal sepsis and pyæmia. It is generally recognized that malignant growths of the vagina relapse with remarkable rapidity, even when we have thought that we had excised in perfectly healthy tissue. Thus, one of Hegar's patients, in whom all the adjacent lymphatic glands appeared to be healthy, succumbed a few weeks after the operation to diffuse carcinosis of the abdominal organs. In one of Kaltenbach's cases, a relapse occurred at the end of two months in the pelvic cellular tissue.

The actual cautery has also been employed in the extirpation of malignant vaginal tumors. Its application is subject to the same rules as in cancer of the portio vaginalis. Gruenewaldt has constricted and removed small cancer nodules with the galvano-cautery loop.

Bandi removed, in this way, a sarcoma as large as a hen's egg during the eighth month of pregnancy. Parturition soon after; relapse at the end of four months, which was again extirpated. Death eight months later from relapses in the glands, pelvic bones and peritoneal cavity.

The use of the sharp spoon need only be considered in those cases in which we merely intend to diminish the bleeding and gangrene, and have abandoned all hope of radical cure.

In benign surface papillomata extirpation with the knife is only indicated in very abundant proliferations, when cauterization promises to be very slow in producing an effect, and the base of the growth is rigidly infiltrated.

EXTIRPATION OF PEDUNCULATED VAGINAL TUMORS.

Fibrous and mucus polypi and pedunculated papillary tumors have been observed in the vagina. Fehling and Reich report polypoid hæmatomata. The greatest dimensions are attained by fibrous polypi (one tumor weighed ten pounds), while mucous polypi exceptionally attain the size of a hen's egg or pigeon's egg. Vaginal polypi give rise to hemorrhagic and mucous discharges, interfere with sexual intercourse, attain considerable dimensions, and create annoyance by compression of adjacent organs or protrusion from the vulva. Mucous polypi have been found repeatedly in very small children.

Martin removed a polypus 18 mm. long from the posterior vaginal wall of a child aged twenty-four hours. Traetzl extirpated a polypus as large as a fist from a child one and a quarter year old. In two cases MacClintock removed mucous polypi by means of ligature and *écrasement*, without interfering with pregnancy; in one case the polypus had undergone gangrene from constriction in the introitus. In other cases large polypi formed an obstacle to delivery, and it was necessary to remove them before the delivery or to push them to one side. The polypi sometimes tore off on account of the descent of the child (either spontaneously or with the aid of forceps), and this resulted repeatedly in severe lesions of the vaginal wall.

Vaginal polypi may be removed with the knife and scissors, *écraseur* or cautery loop.

Hoenig observed a fibrous polypus which was connected with the urethral wall by a pedicle as thick as the finger. A portion of the tumor as large as the fist lay in front of the vulva, a part twice as large was within the vagina; the part corresponding to the vaginal entrance was constricted like an hour-glass. After the hand had been passed around the growth, and had divided a few secondary adhesions between it and the vagina and hymen, the polypus was drawn out of the vagina and its pedicle divided with scissors. The actual cautery did not check the hemorrhage, and it was necessary to ligate the bleeding vessels separately. The tumor weighed nearly three pounds, was 20 cm. long and about 9 cm. thick.

Muellerklein removed with the scissors a cauliflower tumor, as large as a hen's egg, which hung from the upper part of the posterior wall of the vagina by a pedicle an inch thick. Jacobs reported two cases of fibrous vaginal polypi weighing two and two and a half pounds, which were removed successfully with the *écraseur.*

Operative Treatment of Vaginal Varicocele.

Marked dilatation of the vaginal veins is found quite often in women who have borne several children. They either extend over large areas or appear as circumscribed coils. They rarely give rise to severe symptoms. Operative interference is not indicated unless the measures directed against the stasis prove unsuccessful, and there is danger of impending rupture. In one case Simon attributed incontinence of urine to the dilatation of the veins. These formed a vaginal urethrocele, and the entire urethro-vaginal wall was infiltrated with dilated veins to such an extent that the muscular coat of the urethra had disappeared, and only the rim of the external orifice remained intact. The latter formed the only obstruction to the urine, but retained it only during the recumbent position. Simon first divided the veins in the lower part of the tumor, cauterized with chloride of iron, and ligated a few violently bleeding veins. After frequent cauterizations, progressing from below upwards, the numerous small ulcers gradually coalesced and formed an extensive cicatrix. The patient was considerably improved thereby, and suffered from incontinence only after rapid and excessive exertion.

The same results will be obtained in a less dangerous way, as in varicocele of the male, by several ligatures of the varicose bundles of vessels. Kaltenbach observed, even during pregnancy, complete shrivelling of a dilated bundle of veins as large as an egg, which was ligated several times on account of dangerous, spontaneous bleeding.

Transplantation of Pieces of the Mucosa to Vaginal Ulcers.

Beigel employed Reverdin's method in torpid ulcers of the vagina. Five pieces of mucous membrane from the healthy vaginal wall were transplanted to an ulcer of the vagina and portio vaginalis, 6 cm. wide, which had been left over after violent vaginitis and had resisted repeated cauterization. At the end of five days two pieces, at the end of a week all the pieces had taken root, and in six weeks the ulcer was cured. In the second case, an ulcer of the posterior vaginal wall, 6 cm. wide, which had resulted from protracted mechanical irritation, four pieces were transplanted from the flexor surface of the left arm. The formation of offshoots was not noticed until the twelfth day. In eight weeks the cure was complete. The transplanted pieces are to be covered in the vagina with a piece of linen dipped in glycerine and retained by a cotton tampon. The ulcerated surface is not cleaned before the fifth or sixth day, since otherwise the particles may be removed.

Beigel's method is interesting as a variation of a physiological experiment, but possesses hardly any significance as a therapeutical measure. Ulcers which resist vigorous cauterization and thorough cleanliness, are, to say the least, very rare. Moreover, the vagina appears to be unsuited to such attempts at transplantation, as it is kept aseptic with extreme difficulty, and the transplanted shred can hardly be kept fixed in the movable organ.

OPERATIVE TREATMENT OF VAGINISMUS.

The tonic clonic reflex spasms called vaginismus generally affect only the muscles of the introitus, especially the constrictor cunni. But they may also extend to higher parts of the vagina, to the levator and sphincter ani, the muscular tissue of the urethra, the transversi perinei, indeed to all the voluntary muscles of the pelvis. Among the local changes which give rise to spasm of the vagina or accompany it as secondary phenomena, are included redness, inflammation, excoriations, fissures and papillary excrescences in the introitus, at the hymen and edge of the anus, also caruncles at the urethral meatus. The hymen is often considerably thickened, and may even be uninjured after marriage of several years' duration. The vaginal opening is very narrow, and is often situated abnormally far forwards. The urethra may be markedly dilated by attempts at intercourse in the wrong direction. Simpson and Sims found "true neuromata" beneath the vaginal mucous membrane or at the edge of the hymen.

The patients seek the advice of the physician on account of the pain produced at each attempt at intercourse, which renders the latter impossible, and almost always prevents conception. If primary changes, such as papillary excrescences or a very sensitive, rigid hymen, are present, the characteristic reflex spasms may occur during the first attempts at cohabitation. In many cases, however, awkward attempts at intercourse first give rise to local irritative conditions, which are gradually followed by the symptoms of vaginismus. After vaginismus is fully developed, simple contact of the introitus with the exploring finger or sound, attempts at introducing a speculum, or even the mere fear of the pain, may give rise to a spasmodic seizure. In rare cases vaginismus develops in virgins or after marriage of long standing, even after parturition which has been followed by local irritative conditions of the genitalia.

The disease is cured not infrequently by exclusively medicinal treatment of local affections and appropriate attention to general morbid conditions of the nervous system. From the surgical standpoint, also, the chief attention is to be paid to causal indications. Papillary excrescences must be excised with the knife or scissors, or destroyed with the actual cautery or caustics. Sub-mucous neuromata are grasped with forceps and excised. Sims states that this is followed by recovery as suddenly as after the removal of subcutaneous neuromata. If the hymen is very firm, it is nicked on the sides by several incisions, or removed as a whole. In severe excoriations and fissures of the introitus the treatment may be begun by vigorous cauterization of these parts. But these conditions must often be regarded as secondary results of impeded immissio penis, and exclusive treatment of these changes, therefore, can not produce recovery.

If visible anatomical changes are not present or their removal does not cure the disease, the further surgical treatment is purely symptomatic and must be directed against the affected groups of muscles. We endeavor to make them yield by stretching, or overcome their resistance by division or rupture.

Gradual dilatation of the vagina by the introduction of bougies, rubber tampons, successively larger cylindrical specula, or special dilators, whose blades could be screwed apart, was formerly employed, but these methods give rise to such pain that they almost always require, in the beginning, the administration of an anæsthetic. They often increase the irritability and are extremely uncertain in their effects. As a general thing they produce a favorable result only when combined with other therapeutic measures.

A much more effective measure is division with the knife. The muscular tissue of the introitus is either cut towards the sides or somewhat obliquely backwards. If there are spasmodic contractions or fissures at the anus the sphincter ani is also divided. This relieves the tension of those bundles of the constrictor cunni which cross the sphincter ani, and also of some fibres of the levator ani. Simpson recommended division of the pudendal nerve, in order to act at the same time on all the affected groups of muscles.

Sims combines several of the methods hitherto mentioned. The patient is placed in left lateral decubitus during narcosis; the hymen is then grasped with a small pair of forceps and removed from its base as a coherent membrane, by means of curved scissors. The hemorrhage is checked by the application of linen compresses or chloride of iron. As the ensuing cicatrix was often extremely sensitive, Sims divided the vaginal opening on each side about the middle, by a transverse incision an inch in length, and prolonged the ends of the incision in the introitus as far as the posterior commissure, even beyond this into the integument of the perineum. A Y-shaped incision was thus made around the introitus and its muscular tissue cut transversely on both sides. Sims then employed methodical dilatation with special bougies or dilators. This plan causes unnecessarily excessive injury and is to be avoided, because the same results can be obtained by much milder means.

We employ exclusively forced manual dilatation, with or without division or removal of the hymen. The introitus is stretched up to subcutaneous rupture of the muscles. The patient is anæthetized profoundly in dorsal decubitus upon an ordinary examining table, then two to three fingers of each hand (the flexor surfaces externally) are introduced within the introitus and drawn apart as forcibly as possible. This is often attended by a crackling sound of the ruptured muscular fibres. The narrowest introitus can be converted in this way into a flabby, wide opening. But the introitus rapidly regains its tonus, without a recurrence of the spasms. The muscular tissue is probably divided or at least stretched more thoroughly in this way than by deep incisions, and in addition, no open wound is produced, apart from superficial rents in the mucous membrane.

Schroeder advises that complicating dilatations of the urethra be relieved at the same time by operation. He divides the urethra on both sides, excises wedges from the dilated first part of the canal, and unites the mucous membrane in such a way that the small orifice is situated somewhat more anteriorly.

The after-treatment consists in the relief of any irritative conditions which may be present, by means of sitz-baths, compresses, etc. It is of the greatest importance that the patient should not be approached by her husband for some weeks after cicatrization of the incisions or ruptures. During this period we convince ourselves, by the introduction of successively larger specula, which are allowed to remain for a few minutes, that the reflex spasms do not return, and that cohabitation may be presumably effected without difficulty.

By this plan of treatment we have completely relieved the reflex spasms in a considerable number of cases.

In the majority of cases conception occurred soon after the successful treatment of vaginismus. If this did not take place, more or less diminished potency of the husband was almost always demonstrable, and indeed, this was very often the cause of the entire complex of symptoms.

CHAPTER VIII.

OPERATIONS ON THE VULVA AND PERINEUM.

OPENING OF THE OCCLUDED VESTIBULE WITH ABSENCE OF THE VULVA.

COMPLETE absence of the vulva, and, therefore, of the vestibule, is almost always observed in combination with much more important deformities which even exclude viability (abdominal cloacæ, atresia ani, etc.) The integument extends, without any opening for the urethral or sexual organs, from the symphysis to the anus. In order that such cases may possess gynecological and not a purely teratological interest, the escape of urine and, therefore, the viability of the individual must be secured by the existence of an urachus fistula or a congenital recto-vaginal fistula. If this happens, hæmatokolpos and hæmatometra may be produced at the sexually mature period, as in every other form of gynatresia. Hitherto only one case of this kind has been observed and was successfully operated upon by Dr. Magee. It occurred in a girl of eighteen years, in whom the urine was discharged through a "fungous" urachus fistula. Retention of the menstrual blood had existed for one year. Magee cured the patient by making an incision more than half an inch deep into the blind end of the vagina above the anus. Almost a quart of blood was evacuated.

OPENING OF ATRESIÆ VULVÆ S. LABIALIS.

Adhesions of the labia majora or minora on account of imperfect cornification of the cells produced by the rete Malpighii are observed quite frequently in childhood. This condition is termed atresia vulvæ s. labialis, or cellular atresia of the genital fissure (Bokai). Adhesion of the labia majora generally affects only the two posterior thirds and simulates prolongation of the perineum forwards. The line of adhesion is sometimes quite firm, and is marked by a whitish band. The adhesion of the labia minora is usually incomplete, a fine lip or fissure being found either anteriorly, immediately behind the urethral meatus, or in some other part of the line of adhesion. This fissure is occasionally not noticed until the child urinates. In exceptional cases the labia minora in the new-born are entirely adherent even beyond the urethral meatus, so that surgical treatment becomes necessary in the first few hours after birth, on account of complete interference with micturition. In less complete closure the child's relatives generally notice that micturition is interfered with to a certain extent Older children may complain of burning during micturition or grasp the genitals frequently, as if to remove some obstruction. Retention of menstrual blood never occurs in these simple epithelial adhesions, but they may interfere with cohabitation if they persist to the period of sexual maturity.

If the adhesion is loose, simple lateral separation of the labia with the fingers suffices to break it; at the most a small drop of blood oozes here and there from the separated adhesions. In firmer adhesions, such as occur chiefly in the labia majora, a grooved director is passed from the open portion of the genital fissure through the vestibule to the region of the posterior commissure. The line of adhesion is then pressed forward and rendered tense, after which it is divided with a knife or spatula. After division of the adhesions, a little wad dipped in carbolized oil or some cotton is placed between the labia. During the next few days the genitals are frequently washed, the labia being well separated at the same time. Cornification of the upper epithelial layer rapidly occurs under such circumstances.

OPERATIONS IN EPISPADIAS IN THE FEMALE.

Isolated cleft formations at the clitoris, neck of the bladder and urethra, constitute the slightest grade of congenital vesical cleft. They are of great practical importance, because the accompanying incontinence is curable by operation. The deformity occurred in quite a typical manner in the cases described by Gosselin, Roeser, Moericke and Frommel.

A shallow, trough-like groove, which completely separates the labia majora and minora, descends from the middle of the mons veneris. At the anterior extremity of the nymphæ on both sides are situated small nipple-like structures, which are shown to be the symmetrical halves of the divided clitoris by the presence of the corpora cavernosa and remains of the glans, prepuce and frenulum. The groove is lined by a covering resembling mucous membrane, and firmly adherent to the underlying symphysis. It terminates at the lower border of the symphysis near the introitus vaginæ, in a more or less wide opening, which corresponds to the fissured neck of the bladder, or the partly fissured urethra. Urine trickles constantly from this opening; a part of the wall of the bladder is occasionally prolapsed. A portion of the posterior wall of the urethra is sometimes retained as a projecting sharp-angled valve. Operations have been performed only on the cases of Roeser, Moericke and Frommel.

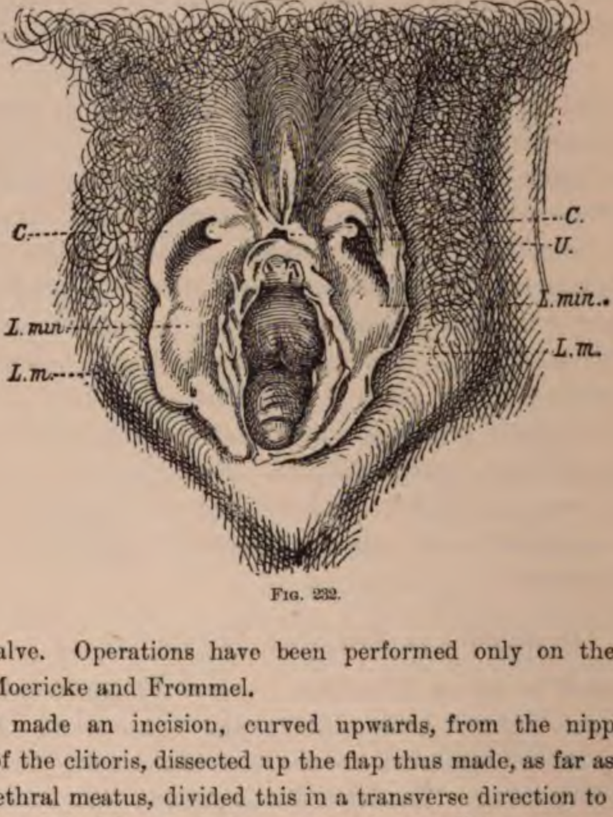

Fig. 232.

Roeser made an incision, curved upwards, from the nipple-shaped remains of the clitoris, dissected up the flap thus made, as far as the level of the urethral meatus, divided this in a transverse direction to the angle of the curved incision, and also separated, to a slight extent, the lower border of this horizontal incision. The flap was then bent over and stitched to both sides of the urethral meatus.

In Schroeder's first case the vesical opening was divided by two lateral incisions. Then both sides of the trough-like furrow were denuded, the flaps made by the lateral incisions were pushed forwards and upwards, and united with the denuded parts by a few sutures. This resulted in a urethra 1 to 1½ cm. long, and capable of closure.

In the second case the denuded surface was triangular, with the apex upon the mons veneris at the beginning of the trough-like groove, and the sides running along the edges of this groove to the inner surface of both halves of the clitoris; the latter was also denuded to a certain extent. From these two points the line of denudation passed to the posterior lateral border of the urethral meatus. The sutures were introduced in the following manner. In order to form an elongated urethra, a small needle with thin thread was introduced from below into the edge of the wound, and withdrawn near it in the surface of denudation; the reverse on the other side. Four such sutures prolonged the urethra 1½ to 2 cm. A metallic catheter was left in the urethra while the sutures were being introduced. Then the two equal sides of the triangle were united by transverse sutures, partly superficial, partly deep. Figs. 232 and 233 illustrate the relations before and after the operation.

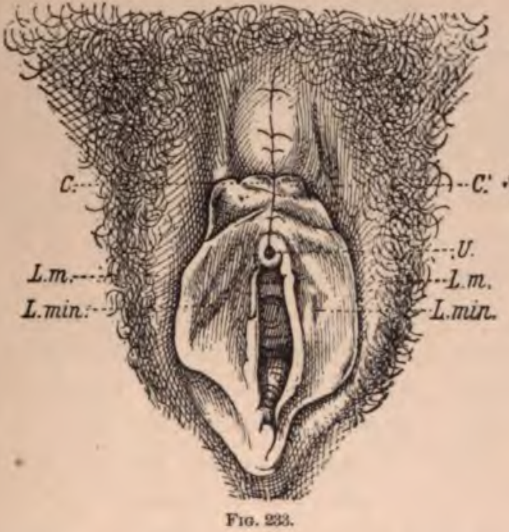

Fig. 233.

In all three cases the incontinence was relieved in a satisfactory manner. A remarkable "vesico-vulvar fistula" observed by Testelin, may also be regarded as a very circumscribed cleft formation of the bladder. In a girl of fourteen years, who had suffered from incontinence of urine since her earliest infancy, Testelin found a canal, 6 cm. long and lined with mucous membrane, which led directly from the bladder in front of the urethra to the outside, and terminated immediately behind the clitoris, 3 cm. from the orifice of the normal urethra, in an irregular opening. The greater part of the urine escaped through the fistula, although there were also voluntary discharges. Testelin produced adhesion of the canal along its entire length, by means of cauterization with caustic potash.

OPERATIONS ON OLD RUPTURE OF THE PERINEUM.

History of the Operation.

Ambrose Paré was the first to recommend the operation; Guillemeau was the first who performed it successfully. At the end of the last century successful operations were performed by Noël and Sancerotte, and later in Germany by Mursina, Mensel, Osiander and Zary. But it was not until a much later period that the operation was generally adopted. The original methods were very imperfect. The edges of the rupture were grasped with forceps and denuded as if along a line, or the knife was simply inserted below the cicatrix and carried by sawing motions to the anterior extremity of the rupture, so that the denudation was about the width of the finger. At first the sutures were introduced only from the perineal side, even in ruptures which extended deep into the recto-vaginal septum. Dieffenbach appears to have been the first to have introduced sutures from three sides, rectum, vagina and perineum (triangular union). He also aided union by lateral incisions. Dieffenbach's triangular union forms the basis of our present methods of operation, and has been especially perfected by Simon. A very important advance consisted of division of the sphincter ani, introduced by Horner, Baker-Brown and Schuh. This produces indirectly an effective diminution in the tension of the line of union.

Anatomical Conditions.

Perineal ruptures almost always begin at the posterior commissure and extend in a sagittal, more rarely in an oblique, direction and to a varying depth towards the anus and even into the recto-vaginal septum. The division into incomplete and complete (complicated) ruptures of the perineum suffices for our purposes. In the former there is merely rupture of the perineum proper (skin, subcutaneous cellular tissue, superficial fascia, constrictor cunni, superficial and deep transversi perinei), while the external sphincter ani and rectal wall remain intact. The vulvar fissure is prolonged posteriorly and gaping. The cicatricial retraction draws the labia backwards and the vaginal mucous membrane downwards. The originally triangular surface of the rupture is thus converted into a small, irregular narrow surface, which is best distinguished from surrounding parts by its slight vascularity and the peculiar tendon-like gloss.

In incomplete as well as complete ruptures the original fissure extends into the vagina, and passes to one or both sides of the posterior columna rugarum. In the worst cases the posterior wall of the vagina is torn into the shape of a large flap, whose edges may even extend into the fornix. In old ruptures, therefore, the lateral borders of the fissure are connected with firm cicatrical masses, which radiate deeply into the vagina.

In complete ruptures of the perineum the sphincter ani is torn, as well as the recto-vaginal septum, to a variable height. The anatomical appearance of the injury is almost always perfectly typical. The recto-vaginal septum ends above the rupture in an edge which is rounded above, in very deep ruptures in a sharply curved edge. Asymmetry of the edges of the rupture is not uncommon, and results from lateral deflection of the rupture around the columna and unilateral retraction of the cicatrix. The posterior columna rugarum is usually retained as a thick ridge, which covers the site of rupture in the septum, but only in shallow ruptures which are not more than two cm. deep. In deeper ruptures, of four to five cm. length, the edge of the recto-vaginal septum is thin and there is nothing left of the posterior columna rugarum, or there are merely a few remains, irregularly distorted by the cicatrical retraction. In lesions which extend into the fornix of the vagina, these remnants often consist merely of thickening of one edge of the wound. Beneath the apex of the rupture we occasionally find bridging cicatricial bands, which are left over after previous operations, or which correspond to small portions of the original wound that have healed spontaneously. If the cicatricial bridge possesses a certain width, the appearance of complete rupture of the perineum, complicated by recto-vaginal fistula, is produced. The radiating folds of the anus are only retained posteriorly, while the lateral edges of the anus are flattened and merge into the cicatricial surfaces of the rupture. The rectal mucous membrane often protrudes behind the rupture as a semi-circular ridge or a tumor as large as a hazel-nut or walnut. After division of the sphincters of the vulva and anus the levator ani and transversi perinei gain the ascendancy, and draw the cicatricial surfaces not alone laterally towards the thighs but also upwards towards the pelvic cavity. The latter movement is effected especially by that portion of the external anal sphincter which is inserted into the coccyx. The traction of these antagonists keeps the vulvar fissure open, the edges of the rupture presenting a concavity to the outside. At the same time the entire part is elevated above the normal level of the perineum.

Rupture of the perineum and recto-vaginal septum results, in rare cases, from a fall on sharp or penetrating objects, such as a balustrade, the back of a chair, the prong of a pitch-fork, etc., and such lesions sometimes present a peculiar clinical appearance from the fact that they affect the genitalia of children and virgins. The so-called central ruptures of the perineum are much rarer than those which begin at the posterior commissure. If they are not closed by sutures immediately after delivery, or later by spontaneous cicatrization, so-called "perineal fistulæ" remain, through which the vaginal secretions and menses are discharged externally. They are usually surrounded to a considerable distance by cicatricial tissue, as the original rupture is jagged and prolonged in various directions and its development is usually preceded by severe contusion of the floor of the pelvis.

INDICATIONS AND PERIOD FOR OPERATION.

Incomplete perineal ruptures cause marked patency of the vulvar fissure, and thus give rise to annoying symptoms of irritation and increased secretion from the vagina and vulva. In addition, descent of the posterior vaginal wall and the uterus is apt to occur.

The symptoms are much more marked in complete ruptures, attended with rupture of the sphincter ani. Fluid fæces and flatus escape involuntarily, and even firmer fæcal masses are retained imperfectly. Partial incontinence of urine is observed in some cases, probably as the result of rupture of the constrictor cunni. The constant soiling of the vulva is apt to cause symptoms of local irritation and inflammation. Violent neuralgias sometimes result from compression of fine nerve trunks within the retracting cicatricial tissue. Or disturbances during cohabitation or pain in defecation occupy the foreground. One of Kaltenbach's patients decided upon an operation, twenty-six years after the development of the lesion, because the constriction of the prolapsed rectal mucous membrane by the lower sharp border of the recto-vaginal septum produced very severe pains. In many cases the disgusting malady leads to profound mental depression. It must be mentioned as a noteworthy circumstance that complete ruptures of the perineum are accompanied much more rarely than the incomplete ones by prolapse of the uterus or vagina.[1]

Although we are discussing only old ruptures of the perineum, we must here refer to an important question, *viz.*, whether perineal ruptures should be united immediately after delivery, as a matter of principle, or whether the operation should be delayed to a later period. At the present time the majority of obstetricians are inclined to the view that the operation should be performed forthwith. This checks the often considerable hemorrhage in the simplest manner, and, at the same time, prevents infectious diseases of the wound. Moreover, the freshly ruptured surfaces, which are not distorted by cicatricial contraction, are easily coaptated upon one another, and we merely require slight assistance from the removal of contused parts with the scissors, in order to make them ready for union. Hitherto we have united, with the best results, all complete perineal ruptures, which have come under our observation immediately after their production. These included cases in which the entire posterior wall of the vagina was torn off in the form of a flap, whose base extended into the posterior vaginal fornix.

Not infrequently, however, there are serious objections to the immediate operation in complicated perineal ruptures. The union of such a rupture always constitutes an important operation, which cannot be performed quickly. It necessitates prolonged exposure of the perspiring and, at the same time, chilly patient, who is exhausted both mentally and physically. The lack of assistants and proper illumination are often more important factors. If the union with sutures is not exact, it is even more dangerous than simple antiseptic treatment of the open wound, because it may give rise to the stagnation of wound secretion in necrotic cavities.

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[1] In many cases this is explained by the fact that the uterus and vagina are fixed in position by parametral and perimetritic cicatricial bands, which are so frequent after deep spreading puerperal lesions. When such factors cannot be adduced, Kaltenbach gave the following further explanation: "after division of the anal and vulvar sphincters, the lower part of the posterior vaginal wall is drawn upwards and forwards by the levator ani, while the sides of the rupture are stretched apart, like the ropes of a tent pole, by the traction of the transverse perinei and sphincter ani upon the cicatrical surfaces. The lower part of the vagina thus forms a firm wall, tense transversely, which does not permit inversion of the higher parts. The rectum, not the lower part of the vagina, is dilated in deep ruptures, and it is the former which presents a tendency to prolapse."

Hence we are compelled to give full consideration to external conditions in this operation more than in others.

If primary union has not been performed, we must wait until the completion of the puerperal involution of the sexual organs, or the fresh wounds are very apt to be infected by the lochia, necrotic portions of the tissues, etc. Holst, in view of his favorable results, has recommended an intermediate operation on the fifth to tenth day of childbed; the sutures are to be applied first, and then the granulations within them removed. But union by sutures at this period, when the granulating wound is protected against hemorrhage as well as infection, offers no advantages but is attended by the above-mentioned dangers. We have observed repeatedly, in the practice of other physicians, that severe pyæmic symptoms with fatal termination developed immediately after perineal suture performed on the eighth to tenth day of childbed. On the other hand the union of old ruptures of the perineum, after the completion of puerperal involution, always afforded us the best results.

If good nurses are at our command we may operate without interfering with nursing, as Kaltenbach has recently done with success in a number of cases. For evident reasons it is inadvisable to operate during pregnancy.

Union of Incomplete Ruptures of the Perineum.

The bowels are thoroughly evacuated prior to the operation. Careful disinfection of the entire vicinity of the field of operation. Narcosis is absolutely necessary. It should be profound, in order that the raw surfaces may not be moved constantly to and fro by the movements of vomiting and straining. The patient is first placed in the lithotomy position with the buttocks close to the edge of the operating table. She should lie perfectly straight, inasmuch as symmetrical freshening of the wound and introduction of sutures are interfered with by lateral displacement of the field of operation. The breech-dorsal position is advantageous during the introduction of the intestinal and perineal sutures.

The operation for incomplete rupture of the perineum corresponds exactly to kolpoperineorrhaphy. Our object is not alone to elongate the cutaneous bridge of the perineum, but also to strengthen the entire recto-vaginal septum in a sagittal direction.

As the cicatricial surfaces of the rupture are very much retracted and distorted, the freshening is not confined to its edges (which are often poorly defined) but the denudation is extended into healthy tissue. We first determine upon the integument of the labia the points to which the perineum is to be elongated. Two incisions, which are slightly concave to the outside, are then made as far as the two points in question, starting from a point in the median line of the posterior vaginal wall, thus forming a triangle with equal angles. As a general thing the apex of this triangle is placed so much higher in the vagina, the more extensive the rupture. Its distance from the posterior commissure may vary from 3 to 6 cm. The base of this triangle is formed, finally, by making an incision which runs transversely between both starting-points in the labia at the boundary between the cutis and mucosa of the introitus, and is somewhat convex towards the anus. The further course of the operation has been described under the head of operations for prolapse.

Semilunar denudation has also been employed a good deal. The middle of the transverse half-moon (about 1.5 cm. high) corresponds to the middle of the posterior commissure, while its lateral halves surround the introitus as far anteriorly as the perineum is to be elongated. The raw surface is folded in the middle, and closed by a double row of sutures from the vagina and perineum. In this way the perineum, in the narrower sense alone, is elongated, while, unlike the previously described method, the recto vaginal septum higher in the vagina is not strengthened in a sagittal direction. Finally, Langenbeck's perineosynthesis and other flap operations have also been adopted in incomplete ruptures of the perineum.

The rare perineal fistulæ, which are left over after central ruptures of the perineum, are freshened in a longitudinal or transverse direction, and closed from the perineum by a simple row of sutures. If there are extensive cicatricial masses in the vicinity of the fistula, they must be removed freely during denudation.

UNION OF COMPLETE RUPTURES OF THE PERINEUM.

The preparations are the same as in incomplete ruptures. In order to prevent soiling of the raw surfaces by fæcal masses, a sponge dipped in chlorinated water or a solution of salicylic acid may be pushed into the rectum during the operation.

The methods of operation may be divided into two main groups: 1, flap operations; 2 triangular union of the rupture.

I. *Flap Operations.*

Langenbeck's perineosynthesis is the prototype of all flap operations. It is the fundamental idea of this operation that the vaginal wall, which, in the original injury, was torn off in the shape of a flap and subsequently drawn backwards and upwards by cicatricial retraction, is to be dissected up and united anteriorly in its normal position. It thus forms a protecting roof for the perineal and rectal wound, which is denuded and united behind and below it, and keeps the vaginal secretions away from the surface of the wound. The later operations of Wilms, Staude and Bischoff are the same in principle but more perfect in technique.

Verhæghe and Biefel give the following description of Langenbeck's perineosynthesis:

First Stage.—Denudation of the free Border of the Recto-Vaginal Septum.—Two fingers of the left hand in the rectum stretch the parts transversely, and a narrow strip of the entire thickness of the vaginal wall is then removed with curved scissors.

Second Stage.—Division of the Vaginal Wall and Formation of the Supplemental Flap.—A flap, rounded below, is cut in the posterior vaginal wall and dissected, in an upward direction, from its base, the recto-vaginal septum being thus divided into two lamellæ. The posterior lamella remains *in situ* and serves to close the rectum; the anterior lamella is drawn forward and united to the anterior portion of the new perineum, where it is to form a surface running obliquely downwards.

Third Stage.—Freshening of the Lips of the Rupture.—A quadrilateral space is described upon the inner surface of each lip by means of a scalpel, and is freshened by dissecting a layer of tissue about a line in thickness. Anteriorly the incision begins at the point where the posterior commissure of the vagina ought to be, posteriorly it passes into the denuded septum on both sides. The entire denuded surface is about 1½ inches long and ¾ inch wide.

Fourth Stage.—Application of Sutures.—The sutures towards the rectum are first introduced, then the flaps of the vaginal wall on both sides are united to the anterior part of the new perineum by two to three sutures. Finally, the fissure in the perineum is united from before backwards.

Wilms's method also consists essentially of, 1. Division of the rectal and vaginal wall, and formation of flaps from the latter; 2. Denudation on both sides of the cicatrized rupture in a symmetrical manner; 3. Linear union of all the raw surfaces and the vaginal flaps.

According to Matzinger, Bischoff operates in the following way:

First Stage.—From two symmetrical points on the posterior vaginal wall, which are 8 to 12 cm. above the introitus and whose connecting line (4 to 6 cm. long) gives the width of the base of the flap, two incisions are made, converging towards the anus, and meeting at the transition of the mucous membrane of the vagina into that of the anus or into the external integument. The scalpel is then passed upwards and outwards from the same points, so that the incisions reach the introitus in the lower third of the labia minora. From the oblique angle thus formed the mucous membrane of the triangle that has been mapped out is removed in its entire thickness with the aid of toothed forceps. As much as possible is removed with the finger-nails and handle of the scalpel, now and then with the blade of the knife. These lateral triangles are denuded to their base, formed by the posterior border of the introitus.

Second Stage.—The flap of the posterior vaginal wall is separated to the same depth as the lateral denudation. This part of the operation requires special care and attention on account of the varying conditions of the flaps and the hemorrhage.

Third Stage.—The entire posterior border of the rima, as far as the extremities of the incisions which start from the vagina, is removed with the knife and scissors, so that the posterior end of the vagina and the introitus, in the space marked out, form a large raw surface, from whose mucous membrane the flap hangs free.

Fourth Stage.—Sutures are first applied in the usual manner to the lateral borders of the fissure of the rectum. Then the two borders of the flap, starting from the apex, are united with catgut sutures to the sides of the lateral triangular raw surfaces running outwardly. The final suture includes the ends of both incisions and the apex of the flap, so that the latter is penetrated twice by the needle, and forms the posterior commissure. There now remains a deep fissure (bounded by two lateral raw surfaces) which forms the new perineum, after its closure by deep silver sutures, which partly include the base of the flap from its lower surface.

II. *Triangular Union.*

In complete rupture of the perineum the continuity of the recto-vaginal septum is destroyed in three directions, towards the rectum, vagina and perineum, and a new closure must be effected in all three directions. This is done by making, upon the lateral walls of the rupture, triangular denuded surfaces *a c n* and *n b d* (Fig. 234) to replace the perineum; these triangles are connected by a shorter or longer middle piece *n c*, *n d*, corresponding to the wall of the recto-vaginal septum. These surfaces are to be united in such a way that *a n x*, *b n x* form the line of union towards the vagina, *a c*, *b d*, the new perineum, and *c e*, *e d*, the wall of the rectum.

The at first strongly gaping walls of the rupture are drawn gradually from the sides into a sagittal plane of union by means of sutures introduced from the middle. These are the general principles of triangular union.

TECHNIQUE OF THE OPERATION.

First Stage.—Denudation.—In order to expose the field of operation the anterior vaginal wall is held away by a broad retractor, or the posterior vaginal wall, above the point *x* (Fig. 234), is simply drawn forwards and upwards with forceps. Then the cutis is seized with forceps or tenacula, at the ends of the boundary of the subsequent perineum, *i.e.*, anteriorly at the inner border of the labia majora at *a* and *b*, posteriorly near the anterior border of the anus at *c* and *d*, and stretched on both sides in opposite directions.

The freshening begins with marking out the triangle *n x n*, with the knife. The point *x* must be situated exactly in the median line of the posterior vaginal wall, about 2 cm. from the apex of the angle of denudation *e* in the rectum. The excision of this small triangle, with its apex directed towards the vaginal fornix, prevents the middle of the line of union from being directed upwards as a vertical ridge when the sutures are tied, and facilitates, at the same time, the drawing of the lateral freshened parts towards the median line. The extension upwards of the denudation in the vagina also separates the apices of the angles of union in the vagina (*x*) and rectum (*e*) to a greater extent, and thus strengthens the recto-vaginal septum proper in a sagittal direction. This increases, to a considerable extent, the security and accuracy of the union, and recto-vaginal fistulæ in the neighborhood of *e* are left over much less frequently. Incisions, which are slightly concave forwards, are then

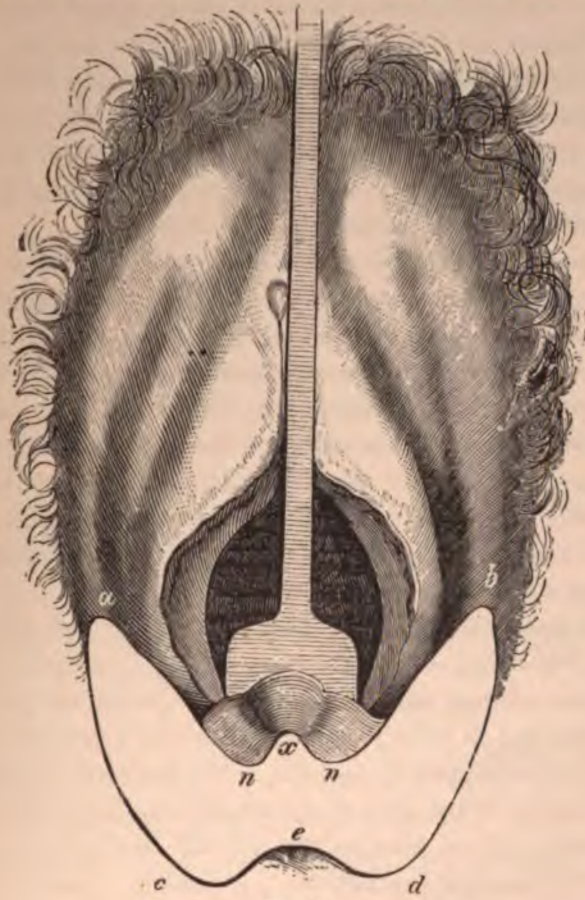

FIG. 234.

made upwards and outwards from *n n* to *a* and *b*, which are to form the lateral boundaries of the posterior commissure; these points are situated at the inner border of the lowermost portion of the labia majora. From here the incisions *a c* and *b d*, (about 3 to 4 cm. in length), which are to form the boundaries of the future perineum, are made to converge downwards towards the anterior border of the anus, and finally the borders of the rectum are freshened by the incisions *c e*, and *e d*. The latter can usually be done better with scissors than with the knife. Within these denudation boundaries the tissue is separated to the depth of about 2 to 3 mm. with a scalpel directed vertically to the surface, the loosened edge is grasped with forceps, and the entire flap is dissected off from above and from the sides, the knife being held flat.

Disinfection of the freshened surface is effected by permanent irrigation with a weak solution of carbolic acid, or by repeated dabbing with concentrated antiseptic fluids (for example, corrosive sublimate 1:2000). The rectal mucous membrane, it is unnecessary to say, should be brought in contact with the corrosive sublimate as little as possible. Parts which bleed considerably in the lateral grooves of the denudation are compressed with sponges (provided with handles) or temporarily grasped in artery forceps. Before tying the sutures the tissue contused by the forceps is excised, and the hemorrhage checked by the sutures. Isolated ligatures of vessels can almost always be avoided.

Most tyros make the mistake of freshening too large an area, and are especially apt to extend it too far towards the lateral parts of the vagina. Tissue is thus sacrificed uselessly and excessive lateral tension produced during coaptation. It is also superflous to mark out a very long and thick perineum by the denudation, inasmuch as the perineum is elongated in a sagittal direction by the tying of the sutures. In many cases, also, the mistake is made of not allowing the lines of denudation to converge strongly enough towards the anterior anal border. Instead of this the lines are made too far to the outside in the cutis. Hence the anterior rectal wall is elongated excessively; it covers the posterior edge of the anus like a roof, and can only be stitched together under great tension.

In shallow ruptures the denudation has the shape of two outspread wings of a butterfly (Fig. 234). The small triangle *n x n*, would represent the head of the insect. The two perineal triangles *a n c* and *n d b*, appear to be stretched, by the short connecting middle piece, into a half frontal, half horizontal surface, and it is only by the successive sutures that they are brought into the sagittal plane of coaptation. The further up the penetrating rectal rupture extends, the longer and narrower grow the two bridges of tissue which connect the perineal triangles (Figs. 235 and 236) and which are united into the recto-vaginal septum proper. The two freshened halves are no longer situated in one plane, but meet at an angle, and the perineal triangles appear, from the first, to be moved into a more sagittal plane.

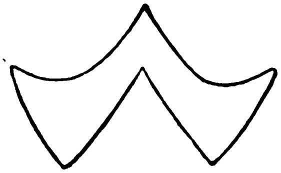
FIG. 235.

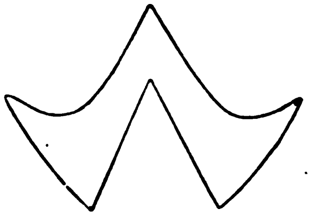
FIG. 236.

If the rupture extends still higher, the perineal triangles become more and more independent of the connecting middle portion. They are situated, from the beginning, in an almost sagittal plane, *i.e.*, the lateral cicatricial surfaces, which are almost in a sagittal plane, may be directly freshened. Kaltenbach noticed this condition very distinctly in a rupture which, after division of a cicatricial septum, extended into the vaginal fornix (Fig. 237).[1]

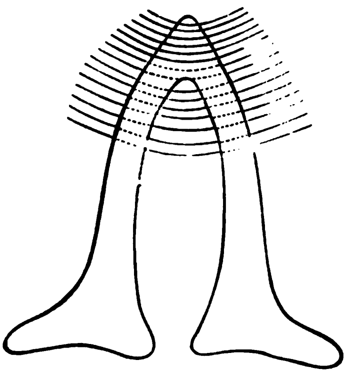
FIG. 237.

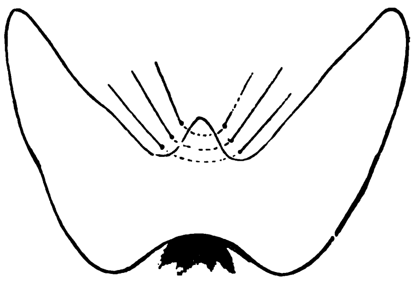
FIG. 238.

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[1] In Fig. 237 the two perineal triangles appear to be rotated markedly to the outside (in order to show the shape of the denuded surface), but in reality they were almost parallel to one another in a sagittal plane.

Second Stage.—Sutures.—After smoothing the raw surface, we begin to introduce the vaginal sutures at the angle *n x n* (Fig. 234.) The semicircular curved needles are introduced 3 mm. outside of the edge of the wound, are passed flat beneath the entire base of the wound, and withdrawn at a corresponding point on the other side (Fig. 238.) Where the raw surface is broader, the needle is removed near the middle of the wound, and again introduced in the immediate vicinity of the latter point, in order to avoid including too much tissue, and to facilitate the coaptation of the edges of the wound from the sides. After a number of vaginal sutures are inserted, a few rectal sutures are also introduced (Fig. 239). A needle is inserted (from the rectum) 3 mm. from the edge of the wound at *r*, is passed from below upwards beneath the base of the wound, and is removed at *r'*. It is now grasped a second time in the needle-holder, with its point directed downwards, and is passed through the other side in a corresponding direction from above downward. The loop of the suture lies in the wound, and the free ends, which project from the rectum, hang downwards (Figs. 239 and 240). Instead of passing the same needle from below upwards and then from above downwards, a needle may be threaded at each end of the suture, and the edges of the wound then perforated on both sides from within outwards. Inasmuch as wires which are cut off short in the rectum often become very annoying, and are removed with difficulty, we now unite the rectal wound with fine carbolized silk or catgut, and pay no further attention to the sutures.

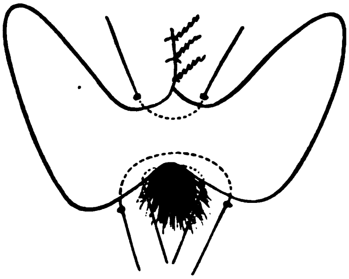

FIG. 239.

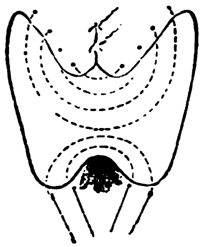

FIG. 240.

Alternate deep and moderately deep vaginal and rectal sutures are next introduced in order to produce reciprocal diminution of tension (Fig. 240). The edges of the vaginal mucous membrane are brought into accurate contact by a few intervening superficial sutures. As a rule, each suture is tied as soon as it is introduced. But when great tension is to be overcome, moderately deep sutures for the relief of the tension are introduced before the deep ones are tied. In this way we secure a gradual diminution of the freshened surface, and can follow accurately the effect of each individual suture. We can thus guage the efficiency of the next suture, and the most serviceable distribution of the denuded territory to the individual series of sutures. At the same time leisure is afforded for further smoothing of the raw surface and the coaptation of the edges. All these advantages are lost if all the sutures are introduced before they are tied.

If the entire line of coaptation towards the rectum and vagina is closed, the perineal sutures are introduced (in the breech-dorsal position) according to the same principles (Fig. 241). While these are being tied, the patient's legs, which had been abducted and flexed at the hip and knee, must be brought closer together in order to diminish the tension.

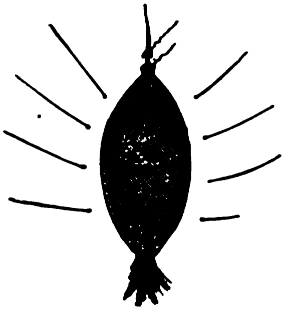

FIG. 241.

In triangular union it is not a trivial matter to decide which series of sutures are to be deep, and which superficial. Dieffenbach and others introduced deep sutures only from the perineum, while Simon properly attached more importance to the rectal and vaginal sutures. Later Simon regarded deep rectal sutures as especially advantageous, and used only moderately deep vaginal sutures. As a general thing we also consider deep sutures of the mucosa as more serviceable than deep perineal sutures, but we somewhat favor the vaginal sutures (Fig. 242). The chief importance is to be attached to the inclusion of the entire surface of denudation by the sutures, and to the absence of openings of any kind between the individual series of sutures.

Very deep lesions may necessitate deviations from the ordinary method of suture. If the rupture extends more than 4 cm. into the rectum, the lateral borders of denudation of the recto-vaginal septum are so narrow that they may be accurately united by a unilateral series of sutures, which include the entire edge of the wound and are tied in the vagina. If the rectal and vaginal sutures were introduced on two sides, too little tissue would remain to be grasped by each series of sutures, while if alternating deep rectal and vaginal sutures were used, openings or inversions of the mucosa in the line of coaptation might result. Lower down, where the surfaces of denudation again become broader, typical triangular union is again employed. Fig. 243 (V vagina, R rectum, D perineum) illustrates this method of suture as employed by Kaltenbach in a case of complete destruction of the septum.

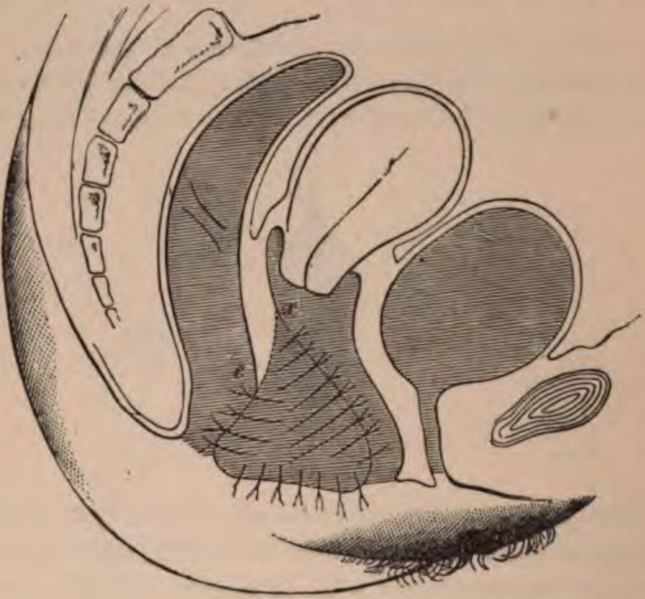

FIG. 242.

After the sutures are applied the blood accumulated between the edges of the wound is squeezed out with the fingers, and the wounds in the vagina, rectum, and perineum are carefully disinfected. Then the sphincter ani is divided subcutaneously or openly by median or two lateral incisions at the posterior edge of the anus. The resulting hemorrhage occasionally requires ligature of the bleeding vessels or parts. According to Hegar, the favorable effect of this division of the sphincter depends less upon direct diminution of tension of the rectal sutures than upon the perfectly free escape of fæces and flatus in the first few days after the operation, without distension of the gut and traction on the line of coaptation. Baker-Brown divided the sphincter ani subcutaneously in the median line towards the coccyx. During the past ten years we have not employed Dieffenbach's incisions for the relief of tension. These were made about an inch outside of the perineal sutures and parallel to them, but about one third longer, so that they extended into the subcutaneous adipose tissue of the nates. If the denudation is not extended too far towards the nates, the tension during coaptation is not great, as a rule, and experience has shown that Dieffenbach's incisions may be dispensed with. If great tension of the cicatrix is to be overcome, as occurs exceptionally after deep necrosis near the rupture, excellent effects may result from Bozeman's plate suture.

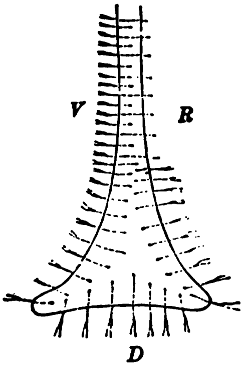

FIG. 243.

MODIFICATIONS OF TRIANGULAR UNION.

a. *Modifications of Denudation.*—Instead of the denudation shown in Figs. 234 to 238, some physicians have adopted a transverse half-moon or a clover-leaf shape (Hildebrand). Freund has recommended a very peculiar shape which resembles the flap operations. He purposes the restoration of the status of recent rupture of the perineum, as is found in flap-shaped rupture of the vagina. Freund's denudation retains the original shape of the injury (Fig. 244) which has retracted into the small cicatricial field (*oo*), but overlaps its boundaries on all sides. An incision is made around the posterior columna rugarum (*a*) at quite a distance from its tip, and it is included between two finger-shaped prolongations of the wound (*bb*), which extend into the lateral torn vaginal recesses (Figs. 244 and 245). The tip of the columna is thus displaced higher towards the vagina. Below this new tip the dorsum of the columna is also freshened, though very superficially, and there thus results a broad vaginal denudation with a very thick median base, which affords a very firm support for the sutures. Further denudation is then performed in the ordinary way (occasionally with roller-shaped prolongations at the rectal opening). Then the rectum is united (Fig. 245, *x*, *y*), then the columna rugarum on both sides to the corresponding edge of the vaginal wound (*o p* and *p q*, Fig. 246), the sinking of the sutures into the folds which are formed becoming noticeable forthwith. Then the raw surface of the inner part of the vulva (Fig. 247 *p z*) and finally that of the external perineum (Fig. 247, *z y*) are sutured.

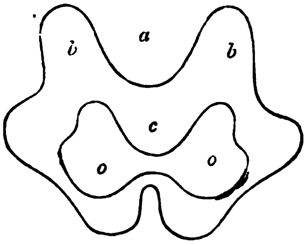

FIG. 244.

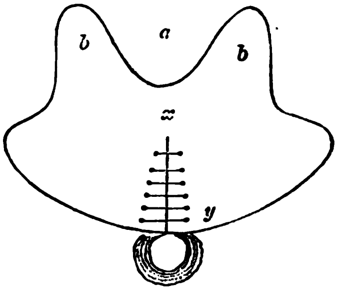

FIG. 245.

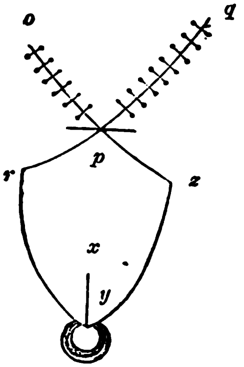

FIG. 246.

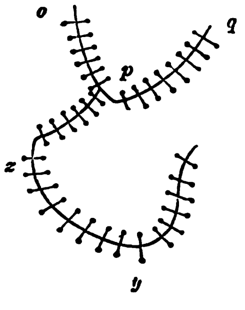

FIG. 247.

b. *Modifications of the Sutures.*—Unilateral perineorrhaphy, in which the sutures inserted from the perineum include the edges of the vaginal and rectal wounds (the latter usually in an oblique direction), will give good results, at the most, in very shallow ruptures of the rectal wall, and has, therefore, been generally abandoned.

Hildebrand has recently resorted to unilateral perineorrhaphy for a part of the line of coaptation. He first inserts the sutures for the triangle of the vaginal wound (Fig. 234, *n x n*), and then the wires for the rectum, while the remaining greater part of the perineo-vaginal wound is only sutured toward the perineum, as in unilateral perineorrhaphy. Hildebrand thus proposes to avoid the divergent traction of the vaginal, rectal and perineal sutures, which, he claims, is apt to give rise to the formation of a cavity, and later of an abscess in the centre of the surface of denudation.

Heppner's 8-suture is based on the same views, and is intended to produce union towards the vagina and rectum at the same time. The threads, which are provided with needles at both ends, are drawn out on both sides in the middle of the raw surface, crossed, and then passed completely through the opposite surface of the wound. The loop of the suture lies in the vagina, the ends which are to be tied hang towards the perineum. A further modification of the 8-sutures consists in tying them in two directions, towards the vagina and perineum.

Some physicians employ two-sided sutures which are tied towards the vagina and perineum. E. Mueller introduces vaginal sutures, then recto-perineal catgut sutures, which, after including the edges of the rectal wound, are left within the raw surface and are cut short, and finally perineal sutures.

Werth has also recommended sunken catgut sutures in the formation of the perineal triangle in old ruptures of the perineum. They are intended to include only the raw tissues, and to be left beneath the superficial sutures which unite the edges of the integument and mucous membrane.

CRITIQUE OF THE OPERATION.

The performance of flap operations requires the presence of abundant, well-vascularized tissues. This condition is fulfilled in recent lesions and in such cases whenever the vagina has been torn off in the shape of a tongue in penetrating ruptures, we have always effected union, with the best results, according to the principles of Langenbeck's perineosynthesis. In old cases the conditions are essentially different. After complicated injuries the markedly shrunken recto-vaginal septum very often presents an insufficient supply of tissue for the formation of a flap. And even if, in more superficial ruptures, there is sufficient tissue and the posterior columna rugarum is intact, a flap formed of these parts does not offer the same succulence and plastic usefulness as at the period of parturition. It is much thinner and less vascular, and has a dangerous tendency to retraction and to necrosis of the edges. Hence it is unfit to form a protecting roof for the new-formed perineum, and its retraction favors the development of recto-vaginal fistulæ. In three cases of perineosynthesis Simon observed the persistence of recto-vaginal fistulæ three times and a perineo-vaginal fistula once. In all instances the abnormal communications were situated in front of the retracted apex of the flap. Moreover the originally broad perineum shortened to a narrow bridge by the retraction of the flap. The same bad results occurred in Bischoff's cases.

Under all circumstances the flap operations produce a large wound of complicated shape. Closure with sutures and checking of hemorrhage are with difficulty performed accurately. Recesses, which are not included by the sutures, are apt to remain below the flap. Hence result, on the one hand, plastic failures; on the other hand, severe septic affections, if stagnation and decomposition of secretions occur in these dead cavities. But if the sutures are passed very deeply through the mass of the flap, its nutrition will suffer.

The results of the flap operations hitherto published are not satisfactory either as regards life or the plastic effects.[1]

We do not possess sufficient material for comparison in order to determine whether the perineum is better protected against renewed rupture in subsequent parturition after flap operations, or after triangular union.

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[1] Among 14 complete ruptures of the perineum (11 old ruptures) at the Wilms' Clinic, there were two deaths from erysipelas and septic peritonitis, and in 4 cases union by first intention did not occur. Among Bischoff's 10 cases, 1 terminated fatally and 1 was not cured; subsequent operations were necessary 4 times. These cases belong in part to the præ-antiseptic period, and, in part, were operated under specially unfavorable conditions. But the results are so different from those attained at the same time with other methods, that the operation itself must also be held responsible.

On account of the shape of the denudation, Freund's method is erroneously included among flap operations by some writers. The posterior columna rugarum, around which an incision is made, remains *in situ* and is not separated from its base. Hence, there is no displacement of the flap, and after union of the vaginal prolongations of the raw surface (*o p*, *p q*, Fig. 246), the remainder of the denudation is simply sutured from the sides without any covering flap. Freund's method requires a considerable amount of tissue, and in every case an intact posterior columna rugarum; the rupture must also have surrounded the columna on both sides. Hence, it can not be adopted in very deep lesions, and is superfluous in those which extend only on one side of the vaginal columna. The denudation is greater than in the ordinary operation, and extends to the lateral recesses of the vagina, which are rich in veins. It is also an unfavorable feature that three series of sutures unite at the apex of the freshened columna, so that the accuracy of the coaptation is apt to suffer at this point. On the other hand it must be admitted that the union of the vaginal prolongations *b b* of the raw surface (Figs. 245 and 246) diminishes the tension of the remainder of the vaginal and perineal wound, *i.e.*, the lateral ends of the perineal denudation are brought considerably closer to one another as soon as the prolongations *b b* are closed by the sutures *o*, *p* and *p*, *q*. In cases of very marked tension Hegar has employed with benefit several lateral prolongations like those recommended by Freund.

Freund also claims that the formation of recto-vaginal fistulæ and vaginal stenoses, which are so frequent after triangular union, is prevented by his method. We will return to the former question at a later period. The degree of vaginal stenosis depends, above all, on the extent of the cicatrices, and the mass of tissue removed in denudation, and in this very respect a comparison would hardly result in favor of Freund's method.[1]

That Freund's method produces very good plastic effects is shown by the very satisfactory results obtained by Freund, Martin and others. The chief objections to the operation are that it is not applicable in all cases, and is more complicated than simple triangular union, without producing better results.

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[1] Thus, B. A. Martin expressly states that he has obtained much more effective narrowing of the vagina by an analogous denudation in prolapse operations than by posterior kolporrhaphy with excision of a median triangular flap.

Among more than fifty of Hegar's perineal operations and twenty-eight of Kaltenbach's, there was not a single death and no severe complication. Complete restoration of continence was secured in all cases, and the perineum permanently retained the same shape and length that it had immediately after the operation. Secondary operations for the closure of recto-vaginal fistulæ were necessary in only six instances. In one case a fistula, which admitted a fine surgical sound, remained immediately above the anus, but it gave rise to no disturbance; indeed, it rarely gave exit even to flatus. Complaints concerning interference with the sexual functions were never made by our patients. We possess no complete reports concerning the fate of the newly formed recto-vaginal septum in subsequent deliveries, but in addition to many favorable reports, we know of only one case in which a recto-vaginal fistula subsequently developed. It must also be mentioned that the lesions were very severe in the majority of our cases. The rupture of the rectum was repeatedly more than 5 cm. in length. In the case illustrated in Figs. 237 and 243 the recto-vaginal septum, in a virgin, was ruptured completely. In many cases one or more operations had been performed by other physicians, and had entailed a further, very considerable loss of tissue. In other cases there were cicatricial masses in the vicinity of the rupture, extending to the nates, or the women suffered from great obesity, a factor which Dieffenbach had recognized as unfavorable to recovery.

These results are of such a nature that we may regard the problem of perineal plastic operations as essentially solved, and that the objections to triangular union are attributable, not to the method, but to errors in technique or in antisepsis. This is especially true of persistent vaginal stenoses and recto-vaginal fistulæ.

In our opinion the great advantage of the triangular union described above, consists chiefly in the greater simplicity of the plastic principle. The denudation furnishes the most favorable shape for plastic restoration, and permits union from the sides with the least possible loss of tissue and without great tension. It is applicable in all cases.

AFTER-TREATMENT.—ACCIDENTS AFTER THE OPERATION.

After the operation is completed the wound is again treated with a one per cent. solution of corrosive sublimate and a tampon of iodoform gauze inserted in the vagina. A wad of disinfected dressing cotton is placed in front of the external genitals. In order to prevent involuntary movements while waking out of the anæsthesia and subsequently during sleep, the knees are tied together with a broad cloth. On the evening of the fourth day an evacuation from the bowels is secured in the manner already described. After each evacuation the vulva is irrigated with a warm disinfectant fluid. In other respects the wound is left entirely at rest. If recovery is aseptic vaginal irrigations are superfluous. The rectal tube, which is to be inserted permanently, and is intended to show the way for the fæces and flatus, we regard as decidedly injurious, as it gives rise to constant traction on the wound and reflex contractions of the rectal muscular fibres. The perineal sutures are removed at the end of a week. The vaginal and rectal sutures are allowed to remain one to two weeks longer, in order that the recent union may not be endangered by the exposure. In removing the rectal sutures the posterior wall of the rectum is drawn backwards with a narrow speculum, the patient being in the lateral or breech-dorsal position. In ruptures which are not very shallow the majority of the sutures are situated in a deep recess above the strongly projecting border of the anus. Hence the latter must usually be drawn down separately with sharp hooks. Inasmuch as this is almost always attended with forcible traction on the line of union, the use of catgut or very fine silk suture, which may be allowed to remain, is decidedly preferable to that of coarser silk or wire.

As a rule, we allow the patient to leave the bed at the end of ten days. The favorable result of the operation is rendered certain by the entirely apyrexial course, the normal passage of flatus and of the first evacuation from the bowels. Anxious patients not infrequently state that "the flatus again escapes in front," although the line of union is undoubtedly intact. This is explained by the fact that on account of the firm pressure of the nates against their support, the flatus is very apt to escape anteriorly between the closed thighs and to pass up towards the vulva.

Hemorrhages and severe forms of infectious conditions of the wound need hardly be considered, at the present time, among the accidents after the operation. The latter, as a rule, entail complete plastic failure, apart from the greater or less danger to life. But partial plastic failure, on the other hand, is comparatively frequent. Openings remain between the adherent raw surfaces, and open towards the vagina, perineum or rectum, and sometimes in several directions.

Simple perineal fistulæ are unimportant; they close as the result of spontaneous cicatrization or cauterization. Perineo-vaginal fistulæ, as a rule, also offer a favorable prognosis and small ones cause little annoyance, even if they persist. Recto-perineal and recto-vaginal fistulæ possess a much more serious import. The former may be cured by cauterization or by division into the rectum, the walls being allowed to cicatrize from the bottom of the wound. But the occurrence of a recto-vaginal fistula is almost equivalent to complete failure, inasmuch as the results of abnormal communication between the rectum and vagina persist, although in a somewhat less severe form.

These recto-vaginal fistulæ rarely heal spontaneously or after cauterization, inasmuch as the fæcal constituents, which enter the canal, give rise to infection. Hence secondary operations are almost always required. The fistulous canal is always situated above the external sphincter ani at the transition between the perineum proper and the recto-vaginal septum; it often empties, at the same time, into the perineum.

The genesis of all these forms of fistula is identical. Decomposed blood or wound secretion first causes a small abscess or deposit of ichor in the centre of the united wound, and then ruptures in various directions. Slight fever and pain in the wound are constantly present during the first few days. Then the pus suddenly escapes, attended by a fall of temperature, and the signs of the abnormal communication follow immediately. The best safeguards against such infectious processes within the wound are the application of vigorous disinfectants (which annihilate all germs entering from the air and the vicinity of the wound) and accurate closure with sutures which leaves no openings and recesses in the united wound. Only a subordinate part is played by other mechanical factors (great tension, early cutting out of the sutures, their divergent traction, traction of the sphincter and levator ani on the line of union, etc.), which were formerly regarded as the exclusive causes of the recto-vaginal fistulæ. Even the method of operation and the various shapes of the denudation are of influence only in so far as they facilitate or interfere with exact closure with sutures. The main advantage of the triangular union consists in the simple shape of the wound, which is easily included in the sutures. A certain significance in the prophylaxis of recto-vaginal fistulæ attaches, finally, to deep vaginal sutures. If, for some reason, a small central abscess develops, it will be more apt to rupture toward the perineum or rectum than towards the firm mass of tissue included in the vaginal sutures.

Continence is not always restored completely despite successful plastic results. A new recto-vaginal septum is formed but it is narrow, the anus is patulous and does not always retain fluid fæces and flatus. We have observed several such cases in the practice of other physicians. A few, which date back to the præ-antiseptic period, probably resulted from secondary separation of the edges of the wound, which had been infected through the rectum. Others resulted evidently from the improper shape of the denudation, which did not extend sufficiently far towards the rectal wall and anus. If the continence is very imperfect, the narrow septum must be divided and the denudation must be made broader towards the rectum and anus. We have successfully performed such secondary operations. The direct union of the separated fibres of the sphincter ani, which is regarded as necessary by some writers, is unattainable. But this is unnecessary, inasmuch as the anus becomes entirely capable of closure if the muscular fibres of the sphincters are inserted into a firm median cicatrix

Operative Treatment of Cysts in the Vulva.

Cysts of the vulva are almost always retention-cysts. They are the result of occlusion of the excretory ducts of the sebaceous glands, and form tumors which are filled with a pulpy, fatty mass, but very rarely attain the size of a nut. The majority of vulvar cysts start from Bartholin's glands. Sometimes the excretory duct alone is distended into a tumor which is, at first, spindle-shaped, but later rounded; sometimes the individual acini are converted into cystic cavities and form multilocular cysts. The contents are clear and serous or stringy and viscid. They may also contain an admixture of blood. In much rarer cases cysts develop in the labia majora or minora independently of preexisting cavities and canals. These either possess simple serous contents or they are colloid and dermoid cysts. They may attain the size of a child's head and usually possess a firm wall, which is separated with difficulty from the firmly adherent cellular tissue. Cysts within the labia majora usually grow downwards, the labia being unfolded more and more or even drawn out like a pedicle behind the tumor. They more rarely extend upward towards the inguinal canal. Cysts of the labia minora may grow upwards towards the vagina.

In retention-cysts of Bartholin's glands the contents may sometimes be evacuated by simple compression, after the excretory duct has been made permeable by means of a sound. But reaccumulation is apt to occur. Larger cysts with a firm wall and conglomerate cystomata should be extirpated (concerning the means of checking hemorrhage and subsequent sutures, *vide* 297). Simple division or partial excision of the wall with suture suffices in small or thin-walled cysts. Puncture and injection of iodine appear to be less certain in their effects.

Extirpation of Neoplasms of the Vulva.

The neoplasms of the vulva present very essential differences with regard to their connection with surrounding parts and their mode of implantation, and these exercise a direct influence on the method of extirpation.

1. Some of them occur as circumscribed tumors, which are situated in the tissue of the external genitals themselves and are covered by normal integument. These tumors may be enucleated. They include lipomata, fibromata, myxomata, sarcomata, and, in part, elephantiatic tumors. The majority of these growths develop primarily within the labia, in the mons veneris or beneath the integument of the perineum. They take their origin more rarely in the ischio-rectal fossa and then extend secondarily to the vulva by continued growth. During their enlargement the tumors situated within the labia unfold the integument of the labia majora and minora (Fig. 248), finally even the prepuce of the clitoris, and are then situated with a broad base and more or less movable on the descending ramus of the pubis and the ascending ramus of the ischium. Lipomata and elephantiatic tumors attain the greatest dimensions and a weight of many pounds.

Method of Extirpation.—If the tumors are small an incision is made along the greatest diameter, either free or after raising a fold of the skin, and the two edges of the integument are then dissected up. The tumor is then grasped with a Museux forceps, drawn alternately to one and the other side, the surrounding cellular tissue divided, as it becomes tense, with knife or scissors, and the base of the tumor is thus gradually reached. If the growth projects far above its base or has drawn out the integument of the labia like a pedicle, a sufficiently large piece of integument must be removed in order that no superfluous tissue remains behind. The same plan is adopted in elephantiatic growths if the cutis itself takes part in the disease by proliferation of the papillary bodies. In order to remove such superfluous or diseased portions of the skin, two curved incisions, which meet at an acute angle, are made over the tumor, and the intervening skin is allowed to remain on the tumor. This also facilitates the enucleation of the tumor, inasmuch as its base is reached more quickly.

Spirting vessels are seized temporarily with artery forceps or ligated forthwith. The largest vessels are always to be expected on the posterior surface of these tumors along the rami of the pubes. Anteriorly the corpora cavernosa clitoridis, posteriorly the branches of the pudendal artery, or the latter itself in the neighborhood of the tuberosity of the ischium, may be injured. On this account timid surgeons sometimes continue the enucleation only until they have formed a sort of pedicle on the posterior surface of the tumor, which is then divided with the *écraseur* or cautery loop. Both plans are not to be recommended. Whenever the mode of insertion of the tumor permits, an elastic ligature should be placed around its base. Excision may then be performed without hemorrhage, and the divided vessels may be ligated separately in the cut surface. In the enucleation of the tumor from the vulva we should endeavor to close the wound as much as possible with sutures, in order to guard against

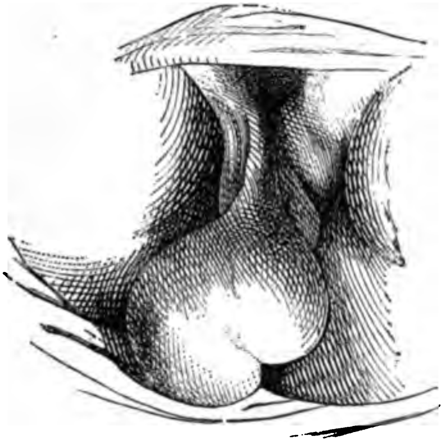

FIG. 248.

external infection. Even if union by first intention is not obtained everywhere, the size of the wound surface is diminished and the period of healing shortened. If the sutures are passed under the entire base of the wound by means of long curved needles, they form a good means of checking the parenchymatous hemorrhage. Short drainage tubes are placed in deep recesses of the wound, which cannot be reached by sutures. The raw surface is smoothed with the scissors before and during the application of the sutures, and the edges cut in such a way that they fit accurately upon one another.

In order to avoid loss of time in applying individual ligatures and not to disturb union by first intention by the ligatures, elephantiatic tumors, into which a number of large vessels always enter, are extirpated by Schroeder, step by step, combined with the immediate application of sutures. He begins the excision from the perineum, and unites the wound by deep sutures after each incision. For example, he first makes an incision around the posterior extremity of the left labium and unites the edges of the wound forthwith, then he prolongs each incision anteriorly, separates the tumor further from its base, and again unites the edges of the skin by deep sutures. He thus advances along each side of the vulva until the incisions meet at the clitoris.

Veh has also published favorable results from this method. In large tumors, however, it is probable that isolated ligature of vessels cannot be dispensed with, since the sutures, which run parallel in great part with the vessels, will not always suffice to check the hemorrhage.

2. A second group of neoplasms is situated flat upon and in the cutis of the vulva. These tumors must be separated from the underlying tissues like a piece of sod. They include condylomatous papillary tumors, carcinoma and sarcoma. The majority of condylomatous papillomata on a virulent base, which extend occasionally from the genitals to the nates and inner surface of the thighs, indicate extirpation only after medicinal treatment or cauterization has proved useless. In such cases the subcutaneous cellular tissue is usually in a condition of fibrous degeneration. Cancroids start most frequently from the inner surface of the labia or from the clitoris. Circumscribed papillæ and nodules first form, then they become more and more vascular, grow moist and are surrounded by a hard wall-like rim. Ulcerative destruction of the excoriated surface soon sets in and the new growth advances at the same time, towards the labia

minora, mons veneris, perineum, and even the inner surface of the thighs, while it usually finds a limit towards the vagina, at the edge of the hymen. Abundant granulations often grow from the base of the ulcerated surface, and may attain the size of a hen's egg as cauliflower-like growths. After some time the inguinal glands enlarge and general infection takes place.

Extirpation of cancroids is only justifiable so long as the adjacent lymphatic glands are intact, and we have reason to believe that the entire growth, together with its hyperplastic base, may be removed. L. Mayer reported a relapsing sarcoma of the external genitals, which Virchow diagnosed as verrucæ sarcomatosæ. Two tumors of the size of a cherry, one with a broad base, the other more pedunculated, were situated on the inner surface of the nymphæ.

In performing extirpation an incision must be made around the entire diseased territory, and must be separated at a suitable depth from the healthy base. The wound surface must be closed as thoroughly as possible with sutures, which, together with a few isolated ligatures, also serve to check the hemorrhage. If we are not certain that all the morbid tissues have been removed, the actual cautery should be applied to the surface of the wound, or cauterization performed with concentrated solutions of chloride of zinc. The attempt to destroy the neoplasm with the actual cautery alone, without previous removal of its base, promises no success. Neugebauer successfully extirpated a cancroid of the right labium majus with the galvano-cautery. With the aid of an exploring trocar the cautery loop was passed below the base of the ulcer and the entire degenerated portion removed near the descending ramus of the pubis. Pacquelin's cautery knife has also been repeatedly employed with success in removing cancroids of the vulva. The hemorrhage is sometimes extremely slight in this operation.

3. A third group of tumors is attached to the vulva by a pedicle. The most frequent variety form papillary excrescences, due to partial hypertrophy of the mucosa, and are known as mucous membrane polypi or caruncles. They generally start from the ring of mucous membrane surrounding the external urethral meatus or from the interior of the urethra, more rarely from the clitoris or nymphæ. They form very soft and easily bleeding tumors of a roundish or mulberry shape, and vary from the size of a pea to that of a nut. They interfere with micturition or coitus, according to their position, and are often extremely painful. Solid and

even cystic tumors may also be pedunculated, inasmuch as their enlargement first distends the flabby integument of the labia like a bag, and then draws it out in a pedicle shaped like the neck of a bottle. This is observed most frequently in elephantiatic tumors. Scanzoni observed a fibroma, as large as a fist, which extended to the middle of the thigh. Schneevogt reports an enchondroma of equal size, starting by a pedicle from the clitoris. Hoogewy mentions a myxoma, with a narrow pedicle.

Mucous polypi and caruncles of the urethra may be simply twisted or torn off with forceps. If they are larger they are drawn forward with forceps and the pedicle then divided with scissors. The small incised wound, which often bleeds profusely, is closed with sutures or cauterized with the Pacquelin.

The other pedunculated tumors are removed with the knife, scissors or cautery knife, after constriction of the pedicle with one or more ligatures *en masse*. If the surface of implantation of pedunculated lipomata or elephantiatic tumors is somewhat more extensive, it is tied provisionally with elastic ligatures, the vessels tied separately in the surface of removal, and the wound closed by deep sutures.

The danger of operation depends on the extent and character of the wound which is left over, the amount of loss of blood during the operation, and the general vital condition of the patient. As a general thing the prognosis is good, even in the enucleation of large tumors, if subsequent decomposition of the secretions of the wound is prevented. Bouquet observed an unusual accident. He extirpated a very large elephantiatic tumor which started from the right labium majus, and, by its weight, had pulled down the anterior wall of the vagina, the urethra and bladder. The operation lasted very long and was attended with great loss of blood. Finally, the pedicle, which was 25 mm. in thickness, was removed with the *écraseur*, and the bladder was injured during this procedure. The patient died of peritonitis.

The result of the operation is not always a radical one even in elephantiatic tumors. Relapses occur with special frequency, either locally or in remote organs, in myxoma, sarcoma and cancroid. Simon extirpated a sarcoma as large as a hen's egg from the right labium of a girl aged eighteen years. Within less than two years relapses occurred four times at constantly diminishing intervals, at first locally in the cicatrix and surrounding parts of the perineum, and in the glutaeus maximus. Finally, the inguinal and supra-clavicular glands enlarged, and, on autopsy, "medullary" nodules were found in the liver. Meyer also extirpated a sarcoma which relapsed several times in the cicatrix, but the further spread of the neoplasm was prevented by repeated removal of the proliferations with the knife and scissors and by cauterization with chromic acid. The patient died years afterwards from apoplexy. Relapses occur most frequently after the extirpation of carcinoma, but successful secondary operations are generally possible, as the relapse occurs first in the shape of papillary excrescences in the cicatrix. In other cases a tolerable condition, at least, may be maintained for a long time by repeated application of caustics. On the whole the effect of the operation in cancer of the vulva seems to last longer than in that of cancer of other parts of the sexual apparatus. The diseased part is recognized early and can be freely excised together with its base. Several of our patients were perfectly healthy one and one quarter to two years after the operation

The occurrence of relapses is sometimes delayed by extensive necrosis of the tissues after the operation. In Veit's case gangrene of the wound occurred after extirpation of a cancroid, so that the loss of substance was much greater than that originally intended. The patient was still healthy five years after the operation.

After-treatment.—The wound is disinfected with corrosive sublimate and dusted with iodoform. It is then covered with an antiseptic bandage, and this is fastened with a T-bandage. If the course is favorable this dressing is not changed until the sutures are removed on the seventh or eighth day. If, after an operation on a malignant tumor, the wound has not been closed with sutures for the reasons mentioned above, the repeated application of strong solutions of chloride of zinc to the suspicious parts is advisable. Careful attention must then be paid to secondary hemorrhage during separation of the eschar.

REMOVAL OF THE CLITORIS.—CLITORIDECTOMY.

Isolated neoplasms of the clitoris are rare, because malignant growths extend rapidly to surrounding parts. Circumscribed elephantiatic enlargements of the clitoris furnish the most frequent indication for extirpation. Dalton mentions a case in which the organ weighed half a pound, and Kugelmann extirpated an elephantiatic clitoris weighing 430 gm. Veit and Braun have extirpated the organ on account of cancroid.

Hypertrophic conditions may also furnish an indication for removal. The excessive development may be congenital. This occasionally constitutes a rare peculiarity, and among the Abyssinians, for example, is said to necessitate circumcision as an habitual operation. It is sometimes associated with hermaphroditism or excessive development of the labia, but may also be an independent condition. In a woman who had borne children, Bainbridge found a clitoris two inches thick and three inches long. Acquired hypertrophy often results from masturbation, but may also occur without any demonstrable cause.

Finally the clitoris, although not enlarged, has been removed for the relief of masturbation or conditions of nymphomania. The external genitals, in such cases, may be entirely normal, or they may be very red and excoriated as the result of mechanical irritation. Baker-Brown mentions fissures of the rectum, which resulted confessedly from manipulations intended to increase the sexual feeling. G. Braun observed a case in which masturbation was cured by amputation of the clitoris and the labia minora. The clitoris was not enlarged, but became erect to the thickness of a goose-quill, on the slightest irritation. On touching it rhythmical reflex movements occurred at once in the labia, abdominal walls and nates. We have observed several similar cases in girls eighteen to twenty years old. The constant erotic ideas had given rise to distressing excitement and insomnia, and the patient sought relief at any cost. The justifiability of attempting to cure the disease by operation can not be doubted under such circumstances, when the general condition of the patients is seriously impaired, and they have lost all will power. But from our own limited experience the results of clitoridectomy and nymphotomy in these conditions do not appear to be very favorable. In two cases the old trouble returned immediately after removal of the sutures, although the patients had pointed positively, prior to the operation, to the part "from which the irritation started." In one case the subsequent excision of a new point of irritation in the labia minora proved unsuccessful. Richet also operated unsuccessfully in one case. Further experience is necessary in order to determine what can be effected by clitoridectomy as a curative measure for masturbation and nymphomania. At all events the indications for the operation are extremely rare

Mode of Operation.—If the clitoris has grown to a considerable size, its pedicle-like insertion is constricted by several ligatures *en masse*, or by a rubber tube, and the organ removed like other pedunculated tumors of the vulva. The *écraseur,* cautery loop and thermo-cautery may also be used. In the case referred to above Braun removed the clitoris and nymphæ with the galvano-cautery. After the excision of malignant growths the vigorous use of the actual cautery or concentrated solutions of chloride of zinc may be advantageous.

If the clitoris is not enlarged, it is drawn forward with forceps and removed, together with the adjacent part of the nymphæ, by several rapid and deep cuts with the scissors. The hemorrhage is inconsiderable and may be checked by the sutures. Isolated ligature is hardly possible on account of the vigorous retraction of the arteries.

Baker-Brown checked the hemorrhage by a compress and T-bandage, which pressed the bleeding vessels against the symphysis. This dressing was also intended to prevent attempts at the old bad habits during the period of healing. As Baker-Brown himself admitted, the patients are not cured immediately after the operation, but only gradually gain control over themselves. The protracted insertion of wire sutures would probably secure more effective aid in this respect.

ISOLATED REMOVAL OF THE LABIA OR HYMEN.

Abnormal size of the labia majora and minora, which hang flaccid from the posterior commissure, occurs as a race peculiarity and is known as the Hottentot apron. In some tribes of Asia and Africa nymphotomy or circumcision appears to be common as a ritual operation on account of this anatomical condition. Even among us excessive development of the labia is sometimes found as an individual or family peculiarity. Scanzoni mentions a family in which the mother and three daughters possessed such unusually large labia, that they could only be distinguished from elephantiatic formations by the otherwise normal texture of the integument and deeper strata.

Such hypertrophic labia give rise to various disturbances which decidedly justify their removal. Walking and standing are interfered with; the hypersecretion of the sebaceous and sweat glands, which is usually present, and the soiling with urine, cause painful excoriations. During menstruation the labia sometimes increase suddenly in size and become the seat of shooting pains. The sexual feeling may be entirely lost. In the most advanced stages of the disease, even coitus and micturition may be interfered with in a mechanical way. Breslau observed incontinence of urine and hypertrophy of the nymphæ, which developed after childbed. When the size of the labia was smaller, the incontinence was also diminished. Hence Breslau first removed one labium with the *écraseur* and this was followed by improvement. Complete recovery ensued after removal of the other labium with the galvano-cautery. We have also observed a case in which the relation of the symptoms was similar, but which we regarded as beginning elephantiasis. The removal is accomplished with the cautery loop, thermo-cautery, or knife and scissors. If the latter plan is adopted we attempt to secure union by first intention by stitching the surface of the wound. Schroeder and Kuestner have recently performed partial or total excision of the labia for the relief of pruritus vulvæ. Schroeder recommends the operation only in those cases of intense pruritus which are confined to very small spots. These parts usually project slightly above the level of the surrounding skin, and their surface is ragged and whitish in color. In one of Schroeder's cases the papillary proliferations proved to be cancerous. Kuestner found the affected parts of the mucous membrane thickly covered with small miliary nodules. The size of the portion of integument excised depends upon that of the itching part.

In several cases merely small pieces of the integument, shaped like a myrtle leaf, were excised from the inner surface of the labia majora or minora. In other cases an entire labium was removed, together with a portion of the clitoris. In one case Schroeder made an annular excision of the integument around the anus. The wound was always closed with sutures. In some instances the cure was radical, in others it was incomplete or of short duration. In two cases Schroeder performed secondary operations. On the whole the results are encouraging. We may here remark incidentally that, in several cases, we have observed the disappearance of intense itching after excision of old cicatrices in perineal plastic operations. Kuestner mentions a similar case.

Removal of the Hymen.—We have previously discussed partial removal of the hymen in atresia hymenalis, and its total excision in vaginismus. In rare cases a further indication for this operation is afforded by hypertrophy of the hymen, which projects between the labia in the shape of a ridge several centimetres in length. Difficulty in micturition may result, in addition to mechanical disturbances. Boivin and Duges mention a case in which this ridge was removed by a ligature. In a similar case, in a child aged two years, Scanzoni excised the hypertrophic portion with the scissors.

OPERATIVE TREATMENT OF COCCYGODYNIA.

The gynecological interest of coccygodynia depends on the fact that it is often acquired in childbed, especially after severe forceps delivery, and that it may be associated with other pathological conditions of the internal sexual organs, such as chronic metritis, anomalies in the shape and position of the uterus. The latter excite the pain, or increase it by direct compression or by favoring passive congestion. Ankyloses, luxation of some of the coccygeal vertebræ, lateral displacement of the lower end of the coccyx, excessive mobility in a sagittal direction, hydrarthrocace of the sacro-coccygeal articulation, periostitis, abscesses on the anterior surface of the coccyx, especially at its junction with the sacrum, and finally caries of the coccyx, have usually been observed as the direct causes of coccygodynia. The pain is located in the coccygeal plexus, and is therefore felt in the region of the coccyx at the inner surface of the buttocks, and in the vicinity of the anus. It is increased by the slightest movement of the coccyx, and by contraction of the muscles inserted into it (glutaeus maximus, coccygeus, sphincter and levator ani, and ischio-coccygeus.)

Surgical interference in this often very obstinate disease is not indicated unless narcotics, local antiphlogosis, etc., prove unsuccessful, or definite pathological changes in the coccyx are present. For example, abscesses on the anterior wall of the bone must be opened, as in Scanzoni's case, or luxations must be reduced if possible.

When such conditions are absent the disease has been treated by Simson, Bryant and others, by subcutaneous division of the muscles and fibrous structures inserted into the coccyx. Division of the glutaeus maximus on one or both sides or of the sphincter ani was sometimes sufficient to relieve the pain.

In dividing the glutaeus maximus a stout tenotome is inserted at the middle of the lateral border of the coccyx, or on its posterior surface a little to the outside of the median line, and the tense tissues are divided above and below. In order to reach the origin of the sphincter ani, the tenotome is pushed immediately in front of the apex of the coccyx. If division of one or more muscles is unavailing, we may gradually divide all the muscles and ligaments which are inserted into the coccyx.

Should tenotomy prove unsuccessful, the partial or total extirpation of the coccyx may be taken into consideration.

The bone is exposed posteriorly, then luxated from its connection with the sacrum, and finally separated from its connections laterally and anteriorly. Simpson exarticulated it between the second and third vertebræ. The results were most favorable when osteitic and carious processes were found. But the operation repeatedly afforded very little or no improvement in "purely nervous," neuralgic forms. The hemorrhage from the wound was often quite considerable, and, inasmuch as isolated ligatures in the fibrous tissue were impossible, required ligature of the tissues or the use of the tampon.

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